C. Hon Jr. 9

LIBRARY OF CONGRESS JUL 5 1888 SMITHSONIAN DEPOSIT

THE AMERICAN GAS LIGHT JOURNAL

ALDMAN & KENNY, N.Y.

PUBLISHING OFFICE No. 42 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, VENTILATION, WATER SUPPLY AND DISTRIBUTION, & GENERAL SCIENCE.

VOLUME XLIX.—No. 1. Whole No. 697. | NEW YORK, MONDAY, JULY 2, 1888. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager.
JOS. R. THOMAS, C.E., Editor. T. J. CUNNINGHAM, Asst. Editor.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y. AS SECOND CLASS MATTER.

Published on the 2d and 16th of each month, at No. 42 Pine Street, N. Y.

Terms of Subscription, Including Postage.—For the United States and Canada, $3 per annum. European countries, $3.50 (15 shillings—18 francs). All payments to be made in advance. Single copies, 15 cents.

Remittances should be made either by post-office order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

The American News Company, Nos. 39 and 41 Chambers street, New York, are agents for this JOURNAL. Newsdealers will send orders to them.

Collections are invariably made directly from this office, for subscriptions, advertisements, etc. We have agents to solicit the same, but they are not authorized to receipt for money.

Books.—We will forward by express, at publisher's lowest rates, any book—scientific or otherwise—to any address in the United States or Canada. No books will be sent C. O. D.

CONTENTS.

An Asterisk (*) denotes an illustrated article.

OFFICIAL NOTICE—

Semi-Annual Meeting of the New England Association..... 1

EDITORIALS—

Obituary—Wm. Helme..... 1
Massachusetts Fire Risks..... 2
Standards of Light (by W. J. Dibdin), with Discussion..... 3
Output of Coal in the United States, 1887..... 7
Spontaneous Combustion..... 7
*Cincinnati's Illuminated Exposition..... 8
*The Griffin Gas Engine..... 9
A Visitor's Impressions at the Gas Institute Meeting, London, 1888. 11

ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 12

The Asheville (N. C.) Works in New Hands—A Hint from Stratford, Ont.—Death of Mr. Aaron Thompson—Conservatively Managed Gas Companies—Resignation of Mr. A. J. Carroll—Death of the Hon. Isaac Stebbins, Chelsea, Mass.—Election of Officers, Paterson, N. J.—Changes in the Cincinnati, (O.) Works—Adjusting Gas Rates at Chicago, Ills.—New Gas Company—Leased—Illuminating Power of Toronto Gas—Enforcing a Philadelphia Ordinance—Natural Gas Company in Trouble—On a Tour of Inspection—Recovered Damages—Infringement Suit—Public Lighting in New York—Memorial to the Late Wm. Helme—A Line from Spokane Falls, W. T.—How is This for Low?—Littleton's Elevated Advertisement—Guild of Gas Managers Visits Pawtucket, R. I.—Society of Gas Lighting Visits New Haven, Conn.—The Eau Claire (Wis.) Works—American Meter Company Contracts—Annual Meeting, Newark, N. J.—Annual Election, Butte, Montana—Western Gas Improvement Co.—Judgment Awarded the Gas Company—Death of G. Walton Goss—Annual Meeting, Ipswich Gas Company.

CORRESPONDENCE—

What Mr. King Did Say when Discussing Prof. Mendenhall's Lecture..... 15

Odd Lots..... 16

Death of Mr. Geo. Richardson—New Plant for the Lincoln (Neb.) Company—Cheaper Gas for Rochester, N. Y.—Award of the Philadelphia Contract—A Veto from Baltimore's Mayor.

The Safety of Compressed Gas for Lighting Railway Cars..... 16
The Market for Gas Securities..... 16

[OFFICIAL NOTICE.]

Semi-Annual Meeting of the New England Association.

BIRMINGHAM, CONN., June 25, 1888.

The semi-annual meeting of the New England Association of Gas Engineers will be held on Wednesday and Thursday, July 25 and 26, 1888, at the Wentworth House, near Portsmouth, N. H. The details of the meeting cannot be given at the present time, but will be in the next issue of this JOURNAL.

It is hoped that this early announcement of the meeting will give sufficient time to the members of the Association to permit most of them to be present.

CHAS. H. NETTLETON, Sec.

OBITUARY—WILLIAM HELME.

It is with no weakly defined impression of sorrow that we address ourselves to the mournful duty of placing before his friends and our readers some account of the busy and honorable life of the late William Helme, who stood for all that is worthy and upright. Although Mr. Helme's physical condition had during the past two years been far from that type which would have given the greatest satisfaction to those who knew him, much hope had been entertained that the seeming improvement manifested, on his return in 1887 from his California sojourn of that year, would eventuate in complete restoration to that vigorous bodily and mental activity so characteristic of his earlier and maturer years; yet such was not to be. Death was not to be balked of his victim, and the end finally came, when peace and rest were meted out to the sufferer, on June 12th, in the quiet of Strafford, a beautiful suburban retreat near the city wherein the greater portion of his life was spent. The primary cause of Mr. Helme's death was a stroke of paralysis received on Sunday, June 3, while he was on his way to attend the usual services of his church.

Mr. Helme was born in Dumfries, Scotland, on the 25th day of April, 1824, and, when a mere child, he accompanied his parents to this country, the family settling in Philadelphia. Having acquired a rudimentary education in the public schools, which primary knowledge, owing to his talent for application and ability to quickly comprehend and retain that which transpired about him, was subsequently broadened and polished into a wide and effective compass, deceased entered the shops of the famous Baldwin locomotive works, where he thoroughly mastered the craft of the practical machinist. Shortly after emerging from this apprenticeship, and whilst still in the Baldwin employ, the position of Superintendent to the Trenton (N. J.) Gas Light Company was offered to and accepted by him. That epoch marked his introduction to the business which he most directly followed during the remainder of his career. We next find him engaged in the erection of the plant of the Augusta (Ga.) Gas Light Company, having completed which he remained in charge of for some time. In 1853 he resigned this berth to associate himself with two prominent citizens of Augusta, the trio having decided to enter the lumber and sawmill business. A site was secured at Brunswick, Ga., and on it they erected what was then the largest sawmill in the South. This venture unfortunately proved a disastrous one, for some three months after the completion of the mill the

latter was struck by lightning and entirely consumed by fire. It was never rebuilt, and the old stack, until within a few years, was a well-known landmark in the vicinity. His sturdy courage, however, refused to remain prostrate, and shortly after we find him in Virginia, busily engaged in the construction of a gas works at Winchester. On the completion of this contract he continued in the same line of work at various points in Pennsylvania and the South. The most important of these, possibly, was located in Atlanta, Ga., the works being put in operation toward the close of 1856. This venture proved a fairly profitable one, until the horrors of the civil war descended on the country. It is needless almost to mention Sherman's famous march and the city of Atlanta in the one sentence, for the naming of either is sure to bring both to mind. However, the gas works were all but destroyed by General Sherman's forces, and he then would have been accounted an enthusiast who proclaimed that Atlanta's rehabilitation would be almost as speedily achieved as had been her dismantling. But the echos of the last local gun of the civil war had hardly found a refuge amidst the pine-clad hills of Georgia, and with the ruins of the havoc of October, 1864, still smoking in her streets, Atlanta's people and those who, although residents of other and Northern cities, still believed in her future, joined hands for the common good. Among these believers was William Helme, and it was not long before the Atlanta gas works stood complete where naught but wreck once signified complete disaster. To these works, then and subsequently, Mr. Helme devoted much careful attention, he having from its incorporation held a large block of stock in the enterprise. The fraternity know full well how faithful to this trust deceased has been, and how ruggedly and ably he steered the Company over the troubled seas of competition, his course in this respect compelling both admiration and respect from his adherents and competitors. During his command at this point (in 1883) he successfully solved the question of how to sell dollar gas and also earn a fair rate of dividend on the capital invested. His fostering care placed the Company on a sure foundation, and it was with pleasure he said to us not two months ago, "The Atlanta Company is in a stronger position to-day than it ever was before."

Prior to the outbreak of the civil war deceased became the senior member of the firm of Helme, Morris & Co., the idea of its originators being the refining on a large scale of coal oil, the possibility concealed in which was beginning to attract the attention of practical men. Their refinery was situated on the west bank of the Schuylkill river, just above the old Market street bridge. They were fairly successful in their prosecution of this business, but on the discovery of petroleum in great quantities, some few barrels were shipped them for purposes of experimentation. While the tests were in progress, owing to the carelessness of one of the laborers, the refinery was destroyed by fire. This, we believe, was the first attempt that was made at the refining of petroleum in Philadelphia. In 1865 he became interested in a mining operation in Arizona Territory, and made that part of this most fatiguing journey—it is hard to reconcile this fact with our present knowledge of the vast extension and growth of the railway system in the far West, and then to remember that all this expansion has been accomplished almost within a single score of years—west of the Missouri river, seated in a pack saddle. Having attended to the construction of the mining machinery, Mr. Helme, still adhering perforce to the saddle, continued on and completed a journey to the Pacific Coast,

On his return from the West he engaged with the firm of A. Whitney & Sons, a widely known firm engaged in the manufacture of car wheels, in the capacity of Superintendent, and remained with them until 1872. In that year he entered the firm of Harris & Brother, engaged in the manufacture of gas meters in Philadelphia, which firm was afterwards succeeded by that bearing the title of Helme & McIlhenny, in which he was senior partner at the time of his death.

Deceased was an active, valuable and outspoken member of the American Gas Light Association, of which body he was one of the original founders. According to the roster of the Association, Mr. Helme, representing at the time the Augusta (Ga.) Gas Light Company, answered the roll call read at the old Knickerbocker Cottage, 456 Sixth avenue, this city, on the occasion of the organization meeting, held on April 16, 1873, and which was presided over by Gen. Chas. Roome. His fidelity and staunchness to the original aims of the Association call for no illustration at our hands; the Society's records bear testimony to such on almost every page. He was one of the oldest in membership of that sterling body, the Franklin Institute, of Philadelphia, Pa., having been affiliated with it since 1844. He was one of its most esteemed advisers, having been on its Board of Managers for many years; a position occupied by him at the time of his death. He was a member—and had for several terms occupied the Presidency thereof—of the St. Andrews' Society, of Philadelphia, and was also one of the managers of the Hayes' Home for Aged Mechanics. Our news columns have from time to time borne witness to the frequency with which he was called on by the shareholders of numerous gas companies in which he was interested, to serve as a custodian of their investments in the capacity of a Director.

It goes without saying that his charities were numerous, and were conveyed with that delicacy which ever marks the assistance bestowed on the worthy by a Christian gentleman. His immediate surviving family comprises a widow and a son, who live to mourn for a true husband and an upright father.

Deceased, as will be seen from the foregoing sketch, combined the sterling and conservative qualities inherent in the people of his native land with the activity and business energy of the country of his adoption.

And now that all is said, and our readers are about to turn aside from their perusal of an unaffected and authentic narrative of the life of one of their craft, we wish to add, on behalf of ourselves, concerning a close personal friendship that extended over many years, that our common industry has suffered, in the death of Mr. Helme, the loss of one who was never unfaithful to himself nor unjust to his fellows.

MASSACHUSETTS FIRE RISKS.

The Bay State has many systems in operation within her limits which resemble in name those frequently encountered in other States; but the seeming difference between her style of carrying out such systems and that pursued by her sisters is chiefly in respect of thoroughness. And the thoroughness looks to be all in favor of Massachusetts. This is notably so in the instance of the doings of the commissioners appointed to overlook certain interests. New York suffers from a multiplicity of such bodies; but the worst feature generally of our home commissions is that they are only heard from when the Legislature is engaged on the task of allotting the amounts needed to carry on the business of the ensuing fiscal year. Then our commissioners find time and voice to exclaim that they cannot do anything of moment until their respective appropriations are increased. Succeeding in this, they are dumb until the next term, when the old familiar cry rings out on the ear of the taxpayer. Apart from this aspect of the situation, we may confess that we were attracted to the difference between the State Commissions of New York and Massachusetts by the receipt recently of the annual report (1887) of the Massachusetts State Fire Insurance Department, which is nothing short of a compendium of extremely valuable information on the items of fire risks, insurance hazards, and so on. The portions of the statistics most likely to interest the gas makers, of course, are those which relate to the fire risk, *per se*, of gas and electric light works. Turning to these we find that 4 fires occurred during 1887 in the gas works of Massachusetts, the total loss incurred thereby being returned at $7,200. Of this amount $4,700 is to be allotted to damage to buildings, the balance ($2,500) to contents. Now this would seem to be a pretty good showing for an industry which includes no less than 64 companies in operation, many of them of huge magnitude, and whose property is assessed for purposes of taxation by local assessors at a trifle under thirteen millions of dollars. Of the four fires, the causes given are as follows: 1 from imperfect firebox; 1 explosion of retort; 1 careless use of matches; 1 incendiary.

On the other hand, we learn that equal numbers (4) of fires are reported to have taken place in electric lighting stations. The losses are returned at $9,108, of which $1,836 represents the loss on buildings, the balance ($7,272) being charged to contents. As near as can be ascertained 53 electric companies were operated in the State in the year under review, and the total value of the investment so represented is probably not in excess of 3½ millions of dollars. The inference to be made is plain.

Of the sources of fires from all causes, according to the tables, we find that 13 were occasioned by electric light wires. Of these, 4 occurred in club and billiard rooms; 3 in dry and fancy goods shops; 2 in dwelling houses; 1 in railroad depot; and 3 are set down as unclassified. Quite a good showing for an infant industry, when to the above is added the fact that $230,000 worth of property was annihilated.

The fire record in electric lighting stations in Massachusetts for this year will greatly exceed its predecessor of 1887, for we already know that in April last the Edison station at Fall River was completely destroyed, the loss incurred being returned at $20,000; while the Edison station on Head Place, Boston, also became a prey to the flames at an early hour of the morning of June 2. In the latter instance $35,000 damage was caused. And these fires are not to be attributed to external causes. The danger or disaster sprang from within and not from without the walls of the stations.

Standards of Light.

[A paper read by Mr. W. J. Dibdin, before the London Section of the Society of Chemical Industry. Our report is taken from the London *Journal*.]

Mr. Dibdin commenced by observing that it would be in the recollection of the members of the Society that on a former occasion he had the honor to submit the results of some experiments which he had conducted upon the much-vexed question of standards of light. At that time he concluded his observations by stating that it appeared to him that the only desirable way of settling the matter would be by carrying out a series of tests upon a photometer so constructed that one central flame would be tested simultaneously by four different standards, and that the variations due to eyesight, manipulation and so on, should, as far as possible, be overcome by the observers taking each one of the standards in operation and comparing the results so obtained. He had now concluded a rather long series of investigations conducted in this manner, and had given the results in a report to his Board. He might mention that every possible care was taken in obtaining the most accurate results—not only by using the photometer specially constructed for him by Messrs. W. Sugg & Co., Limited, but by every other means. The one great fault, as far as his own work was concerned, was that the room in which he conducted his experiments was too small; but he did his best to obviate this by reducing the temperature as far as he could, and keeping it fairly constant. The room was warmed by means of hot water apparatus heated by gas; and for the purpose of maintaining an even temperature he used a modified form of the well-known mercury thermostat. This he found to work well. The author here explained the arrangement he used. It consisted of a "battery" of six thermostats, which, he said, gave a greater range, and was more sensitive than one. By this means, the instrument being placed in the room in which the experiments were conducted, the gas going to the hot water apparatus passed through the thermostats, and so they acted as a perfect control. Obviously, when the temperature of the room began to increase, the mercury rose, and so cut off the gas supply. By this plan the temperature was kept during the winter months, with one exception (Dec. 16, 1886), at an average of about 65° F.; and this he considered a highly satisfactory result, seeing the difficulty resulting from the constant burning of different standards, and the presence of four or five operators in the room at the same time. This system was being introduced into the Metropolitan gas testing stations—he believed with a considerable increase in the accuracy of the work done, and certainly with greater comfort to the gas examiners. Where there was no such control, and the hot water apparatus had been set for a cold day, on a change of weather taking place, it was no uncommon thing for the gas examiner to find the temperature somewhere about 80° F.

The author then proceeded to point out the main features brought to light by his experiments, and the obvious conclusions to be derived therefrom. Taking these in order, he found that the pentane air-gas flame of Mr. A. Vernon Harcourt was everything that he formerly stated it to be. They found it steady and reliable; and it was very satisfactory in its results and easy to work. [Mr. Dibdin then described the lamp and its manipulation, by the aid of a small holder and one of the lamps.] Into the holder he put 1 cubic foot of air and 3 cubic inches of pentane; and in the course of an hour or two the mixture of air and pentane was perfect, and then they had a gas which, when burnt at the rate of 0.5 cubic foot per hour, gave a flame 2½ inches in height, and produced a light equal to 1 candle. He found this remarkably constant.

The next standard referred to was the Methven slot. This was merely a standard Argand burner which formerly burned simply common gas. Mr. Methven had improved it by carburetting the gas with vapor of pentane. The author showed the height of the flame in Mr. Methven's arrangement when ordinary gas was used with a long slot; but when the rich gas was employed, Mr. Methven altered it so as to use a wide slot, and so lowered his flame to the height shown. He (Mr. Dibdin) found that the amount of light passing through the slot was about equal to 2 candles. The uncertainty as to the height of the flame was the chief objection he had to the Methven standard, as leaving too much to the discretion of the operator. This point was one of great importance when carburetted gas was used, as slight variations led to considerable differences in the readings.

With regard to what was known as the 10-candle test, devised by Mr. Sugg, the idea was very different to the Methven. The flame was set to about 3 inches in height; and the amount of light that was taken for the standard was that which passed underneath the screen; and this, with 16-candle gas, was equal to 10 candles. The gas was passed through a meter, upon which Mr. Sugg had marked a scale for connections when gas of luminosity different to that of 16 candles was used. The top of the flame being cut off, it gave different results; and he (Mr. Dibdin) soon found that, if they were to have a very reliable standard, coal gas could not be used without these corrections, and this introduced certain arguments into which he would not go. It occurred to him that a modified burner should be used, by which means air simply carburetted by passing over pentane in a Methven carburetter should be employed in place of the coal gas. He asked Mr. Sugg if he could modify his 10-candle test burner so as to consume carburetted gas instead of ordinary gas; and by these means they had a standard flame independent of the gas supply, and one also free from the defects due to a slight variation in the height of the flame. In this particular standard they had one which combined the advantages of the other three, in that the height of the flame within very considerable limits—nearly 2 inches—did not make any difference in the amount of light passing underneath the screen. Here, then, they had an independent standard—independent of gas; there was no measurement of the quantity of air; no measurement of the quantity of pentane; no correction for temperature; and in all cases he obtained 10 candles of light from the flame when he put it between 2½ and 4 inches high.

The next standard to which Mr. Dibdin referred was the amyl-acetate flame of Herr von Hefner-Alteneck, which, he said, had deservedly obtained a considerable amount of credit on the Continent, and a great deal of attention. The steadiness of the flame was very marked; and the amount of light given from it was also equally marked. For some time he was very doubtful as to whether it would not be his duty to report upon this standard as the most useful from all points of view. It was neither more nor less than a simple spirit lamp; and there was nothing whatever to exercise any undue skill on the part of the observer. There was only one fatal objection to it, and this was that the color of the flame was very red, as compared with that of the other standards, so much so that some observers would have considerable difficulty at first in obtaining anything like reliable readings. In practice, no doubt, they would be able to get good results; but he considered it a very serious objection to any standard that it should vary from the ordinary color of the standard Argand flame. The tendency in the present day was to increase the illuminating power of the gas, and to get a whiter light—not to get a very dim yellow or red light, as the case might be. He certainly should not have liked, in view of the other better-colored standards that they had, to recommend this one for adoption. This, however, was really the only thing he had against it; its simplicity and constancy were everything one could desire. Mr. Dibdin here incidentally remarked that Mr. Harcourt had devised a new form of pentane lamp. As this, however, did not enter into his experiments, he did not think it right to show it that night.

Attention was next called to the incandescent platinum standard of M. Violle; and the author exhibited an arrangement which had occurred to him by which platinum foil was melted with an oxy-hydrogen flame. Observations were taken by this, at the moment of melting, of the amount of light afforded by a unit surface. Repeated trials with this had not yet resulted in sufficiently constant results to warrant their publication. The uncertainty of equally heating the whole of the surface of the platinum exposed, and the buckling of the foil by the repeated heating and cooling, were the reasons of the results being far from constant. He was afraid that this apparatus was rather more pretty than useful.

A series of carefully conducted spectroscopic observations of the various flames gave fairly uniform results, except in the case of the amyl-acetate lamp, which had a considerable diminution of the blue and yellow, while the red and green were very distinct.

Referring next to candles, Mr. Dibdin said that one difficulty due to candles arose from the elevated temperature of the room, as, when this was unduly high, the indications of the value of the opposed flame were at times materially increased. On December 16, 1886, he carried out a series of experiments for the purpose of testing this. When they started, at 11 o'clock, the temperature of the room was 68° F.; and at 1 o'clock it had risen 3°. The indications of the central flame during this period were as follows: Candles, 16.8; Keates' lamp, 16.5; pentane, 16.2; and the Methven, 16.1. They then raised the temperature to 74° by 2.25; and from then to 4.15 it rose another 3°, during which time they obtained the following results: Candles, 18.3; Keates' lamp, 16.3; pentane, 16.5; and Methven, 16.0. Therefore, in the case of candles they had an elevation from 15.8 to 18.3; and in the others no appreciable difference. This confirmed his statement that in high temperatures candles were very apt to go wrong. He should be sorry to put this down as a law, and say that candles did not go wrong under any other conditions, because, as they were well aware, candles would give variable results when the tempera-

ture remained the same; and he found that they went equally wrong under all circumstances.

The next question the author said he had to consider was the selection of the standard which should be recommended for adoption. In this he was guided by three main conditions, all of which were found in the pentane air gas—viz. (1) That it is a definite combustible material; (2) that the condition in which it exists at the time of use is under control and capable of after inspection for verification; and (3) that the rate of combustion and the manner in which it is effected are readily observed. In the case of candles, they were supposed to have a definite combustible of sperm; but they did not get sperm, or anything like it, as another substance was introduced into the sperm to "break the grain." With regard to the second condition—that the material, as it existed at the time of use, should be under control and capable of after verification—this appeared to him to be very important, because where they had legal liabilities and penalties, it could not be satisfactory to the parties who had to suffer those penalties if they had no opportunity of inspecting the work done, and having their case argued on its merits. The third condition naturally followed if the second obtained. He had no hesitation in saying that, putting aside all personal considerations, and looking only to the actual figures before him, he was led to one conclusion—that the pentane air gas was, from all points of view, the most desirable for a legal standard.

Reference was next made to the exhaustive inquiry instituted by the Board of Trade some ten years ago, when it was decided that the pentane air gas flame, as devised by Mr. Harcourt, was equal to one candle, and that the Methven standard was equal to two candles and to two pentane lights.

Some little time ago, when it was proposed to have a new testing station in the metropolis, he thought it would be desirable if they could have a pentane unit tried in practice; and he threw out the suggestion. The company concerned very readily concurred in the idea; and they asked that the pentane Argand should be fitted up as well, and that these standards should be systematically used with the legal candles, so as to see whether the observations made with special care would be continued under ordinary rough usage and everyday work. The station was being fitted up, and he hoped to have it shortly in operation. Having got so far at one of the local stations, he trusted the time was not far distant when they would have all the stations fitted with one or both of these units; and then they would see the last of their friends, the candles. This matter, it seemed to him, was one which might be very easily arranged between the parties interested—that is, the Board of Trade on the one hand, and the gas companies on the other.

In considering the question of how a change in the law could be obtained so as to permit the use of pentane, or a qualified higher power substitute for it, in the place of candles, he said he did not imagine that anything of a political nature would affect it. It might possibly be considered that the present vexed question of local government would block the way; but it mattered not whether they had fifty County Councils, they required a reliable standard of light. If there was thoroughly hearty co-operation amongst the parties interested, and they came to an unanimous agreement as to what should be done, there would be very little lost in accomplishing it. He had spent a considerable amount of time over this matter. It had received his careful attention for more than ten years; and there were others before him who had devoted a much longer period to the subject than himself. He hoped this very troublesome question would, therefore, before long be settled once for all.

In conclusion, Mr. Dibdin referred to diagrams showing the average result of each day's work, which he had prepared for the purpose of facilitating the comparison of the various tests conducted during his inquiry.

Discussion.

The Chairman said when they had the pleasure of hearing Mr. Dibdin's previous paper they were all struck with the immense progress which had been made in photometry; and they had waited with considerable interest for the results of the promised further investigations into the standards of light. They had now heard most interesting results, which seemed to promise, with very great certainty, that their venerable friend the sperm candle might well be done away with. The desirability of this became more and more evident to anyone who had followed the history of this matter. In the early days very varying results were obtained; and then he supposed that 10 per cent. error was not considered a fatal defect in photometry—at any rate, it was better than nothing. It was evident now that the standard itself required an accurate verification; and in this pentane lamp they certainly seemed to have what was required, if only it afforded the same constant results when it was in less skilful hands. He always felt with an instrument of this kind that the fact that it was not always in the master's hands—that its practical working would be intrusted to others—should be taken into consideration.

Mr. R. Harris said they had listened with great interest to the very able statements made by Mr. Dibdin. He thought he should be expressing the universal idea when he said that the candle as a standard had on several occasions proved to be somewhat unreliable—perhaps he might go further and say very unreliable. At the same time it was proposed to substitute some standard that would be superior to the candle. He maintained that it would be necessary to be very careful in what they did. As far as the candles were concerned, they were all acquainted with the great differences that arose in the manipulation of them; and as regards the other standards which had been proposed, they had been tried by eminent scientists, and had been stated to be very superior to the candle. But he could not help thinking that there was some little error in the comparison, because these new standards had been operated by men accustomed to very delicate manipulation; whereas the results that had been obtained with candles had been arrived at by men who were accustomed to the work they had to carry out as that of everyday commercial life. He would state briefly his own experience with candles. As was very well known, they were continually testing with candles; and, as the result of this testing, he could not say there had been the excessive variations that were sometimes recorded as the result of the public examinations. Notwithstanding this, he did not for one moment wish to uphold candles in preference to the standards which had been brought forward; but he thought it would be necessary to be very careful, in making any change, to see that they had the proper standard, and that it bore the proper relation to the candles. With regard to these standards there was, in his opinion, one important matter to be considered. It was not only a purely scientific and accurate standard that was wanted—such might be very useful to deposit at the Standards Office—but one that was fitted for everyday work, one that could be easily manipulated, and thoroughly well reproduced at any time; for if a question arose as to what the illuminating power of a gas should have been at any particular time, one great difficulty they experienced was that when the test was once made it was utterly impossible to try it over again, so as to ascertain whether the manipulation was right or wrong. This was a difficulty which had arisen. He himself had not made any minute examination as to which of the various standards was the best; but the experience he had had laid before him at different times—if he might express an opinion at all—was that the best standard that they had would be a modification of the one known as the Methven. His idea had been directed to having a standard as near as possible to 16 candles, which was the standard for gas in London. He thought if a standard could be contrived that would give a constant light equal to 16 candles, this would be the very best form that could be adopted. It would be something after the form of the 10 candle standard, only that it would be a larger flame, with a less portion cut off. The object of this would be that atmospheric conditions, which they frequently found affected the test, should be equal on both sides of the central disc.

A member remarked that he thought he could shed some light on the extreme variation of luminosity that had been found in sperm candles. If they took spermaceti derived from Southern sperm oil they would find absolutely no difference in its luminosity. The variation which Mr. Dibdin and others had found was no doubt caused by the candle maker using spermaceti derived from the bottle-nosed sperm whale which was found in the Northern seas; and the luminosity of this spermaceti was undoubtedly greatly inferior to the spermaceti derived from the true sperm whale found in the Southern fisheries. It was probably slightly attributable to adulterations.

Mr. Otto Hehner remarked that there was much disagreement upon this question of standards of light; and there only appeared to be this one point in agreement—viz., that candles were about the worst positive standards that could have been brought forward. With regard to the varying luminosity of sperm candles, he thought that any man who had regularly made tests must have come to the conclusion that the composition of the candle had nothing to do with the matter. He himself had frequently subjected to analysis candles which had given very widely varying luminosities; and he found that this was not so much due to the spermaceti itself as to the wicks in it. Upon the twist of the wick, and the quantity of chemicals put into it to make it burn properly, depended whether or not it would indicate a high or low result. Sometimes the wick was saturated with borax or other material, and particles of borax formed at the ends of the wicks, and this affected the observations. With the same packet of candles, in one evening, with the same gas, divergent results could be obtained. In fact they knew that in this matter it almost entirely rested with the gas examiner whether he chose to

select a candle that would yield a low illuminating power, or one that would give a high return. At the will of any metropolitan gas examiner, in a single evening's testing, he could get either 16 or 18-candle gas from the same supply. They had before them a number of averages of testings with candles; but they could all see how fearfully wide they were. When one considered how much labor was spent upon the testing of gas every day in London alone, and with the knowledge of how very unsatisfactory was the method by which this testing was done, it was deplorable the amount of energy that was wasted. Then with regard to the question as to which of the proposed new standards should be taken, it appeared to him that Mr. Dibdin, in his conclusions, had looked at the matter from two points of view. Mr. Dibdin had made a considerable number of observations, and had shown that many of the standards gave constant results. Then he laid down some arbitrary rules as to what conditions the standards ought to fulfil. They ought to be of constant composition; that they should be under control and inspection; and that the rate of consumption of the testing gas should be easily observed. He should like to know how the lamp which had been chosen satisfied the condition that the composition should be readily ascertained. Let them imagine a meter filled with pentane gas containing a certain number of cubic inches of pentane air, who was to decide whether this was really proper pentane gas? An analysis of the gas could not be made very readily. In fact it seemed to him that it did not fulfil the condition that the composition of the standard should be capable of exact verification. Pentane gas as proposed in the lamp under consideration had this disadvantage: It threw on the gas examiner one more burden than he at present had—that was, to make his own standard. Hitherto the gas examiner had had nothing to do with the standard. It had been frequently said that all gas examiners were not men of the highest stamp. This certainly did not apply to the London examiners; but still he thought it undesirable they should make their own standard gas. They had always been furnished with candles; and they had used these candles whether they were good or not. That it was not capable of verification seemed to him to be the fatal defect of the pentane standard, however excellent might be the results it was capable of giving. Then they came to the other standard; and it seemed to him that of those which were depicted on the diagrams, the one that gave the best result was the 10-candle test in its two modifications. Mr. Dibdin had excluded these from his selection, because they did not fulfil his arbitrary conditions; but he (Mr. Hehner) held that they should be judged by their deeds. They had given constant results; and, quite apart from any limits or conditions that should be laid down, he thought that one should be selected which showed the fewest variations and was easiest in its application. He hoped some standard of this kind would be adopted which would not throw any additional responsibility upon the gas examiners, who had sufficient to do at present.

Professor W. Foster said that in all discussions of a one sided character he always felt inclined to say something on behalf of the weaker side. It was not the first time he had risen to speak on the subject of candles, although he did not think they were all they might be. When first appointed a gas examiner, now nearly 20 years ago, the candles were burnt in a way which was not altogether the most favorable, and some figures of his own on this matter were in print. The photometer then used was still employed; and it was nothing more nor less than a closed box. With reference to the standard substance which had been proposed for adoption, he thought that, being a fluid, it was on such grounds preferable to ordinary sperm, or any other solid which had to change its state during use. If they could get a pentane gas of constant composition (they were told by Mr. Harcourt that he could obtain a gas of constant composition, or correct for variations), such gas, as a standard substance, would have many advantages in use over those of an ordinary solid-like sperm. There was, however, one point in the use of the pentane gas which appeared weak, and that was employing a one-candle standard. He was, therefore, glad that Mr. Dibdin had entered upon a modification of this so as to obtain, say, a 10-candle unit. Mr. Harris had touched upon this, the most cardinal point. The unit should bear some relation, or rather approximation, in size to the light measured. To measure a 50-candle power light by a standard candle would not be so easy. Therefore he thought that if they were devising a standard for ordinary use—for the use of the ordinary gas examiner—it would be as well to remember that the standard candle was not altogether desirable; and if they could get a 16-candle standard, all the better. With reference to the use of slots, he rather objected to those of a rectangular shape, like Mr. Methven's. He rather preferred the upper portion of the flame to be cut off. He thought there would be some objection to the rectangular form of slot if the disc of the photometer were brought in ordinary working anything near the slot. Still he found such an arrangement very useful for many ordinary purposes. He believed that the amount of light passing through the slot and falling on the disc might itself give rise to some variation in the readings. He did not wish in what he had said that the remarks should be taken as an argument in favor of candles being continued as a standard. Whatever light was to be used as the standard it should be burning as freely in the air as the gas which was being tested. To put the standard, or any other light, in a box where the temperature increased, and the supply of air might vary, was not at all a satisfactory way of testing. He (Professor Foster) had a letter from Dr. Letheby, in which he went very fully into this matter; and the reason why Dr. Letheby never entered into a public discussion on the subject was that he had an instrument of his own design.

Mr. Frank Livesey said he thought those who had helped Mr. Dibdin in his experiments best knew what praise was due to him for the trouble he had taken in order to get the useful results he had obtained. He (Mr. Livesey) considered that Mr. Dibdin had proved that candles were unreliable, and it was very easy to maintain this. He judged from the paper that the author obtained the best results from carburetted air passing over pentane, burnt in a 10-candle standard. This seemed to be very simple. There was no gas to make; and Mr. Dibdin told them that whether the flame was 4 inches or 2½ inches high, it made no difference to the illuminating power passing under the horizontal screen. If this was the case, it was simplicity itself. There was, however, one point about it which he should like to urge—viz., as Mr. Harris had mentioned, he should like to see the 10-candle standard converted into 16 candles. They knew that increase in temperature increased the volume of the gas; and in the same way the barometer was itself affected in volume also. They had tables given them which had been carefully worked out to allow for this difference; and Mr. Dibdin had likewise endeavored to keep the temperature of the room at 60°. On a day when it was 80° outside it was a rather difficult matter to keep the temperature inside at 60°. If the 16-candle standard were used, and if this gas were burned at both ends of the bar equidistant from the disc they would not require any corrections.

Mr. W. Sugg said there were one or two points which had been raised in the discussion to which he wished to refer. One important point was touched upon by Mr. Hehner, who did not see the way for the gas examiner to make the pentane gas always exactly alike. Well, a great deal of thought had been given to this matter, and there was one very simple way of doing it. If a certain quantity of pentane was sealed up in a bottle, that bottle might be put in a case fitted inside a gasholder like the one exhibited; and the mere fact of screwing down the cap of this case would break the bottle, and so they would have an exact quantity of pentane placed in the holder without any chance of escaping. When they had the pentane in the gasholder, with the proper quantity of air, Mr. Hehner would admit that gas made like this would always be uniform. Perhaps they would excuse him for not preferring the single pentane flame to the 10-candle test or the 16-candle test, because it was natural that he should like that arrangement which he had worked with so long better than the other. As had been said by Mr. Dibdin, there was a considerable "come and go" in the height of the flame without appreciably altering the illuminating value of the portion that was cut off. Thus there was a very considerable range in the adjustment of the height of the flame, which would make it easy for the gas examiner to provide the proper standard of light at the opposite end of the bar by which to verify the illuminating power of the gas. Probably they might not adopt the 10-candle standard, because a 16-candle standard had been proposed; but they would no doubt like to know that he had made a burner which would now give 16-candle light in the same manner as the one present would give 10 candles. It seemed to work as accurately with the pentane gas as the 10-candle one; and there seemed to be no more trouble for an ordinary workman to make the pentane gas for this than there was to make a slightly different pentane gas for the 10-candle. With regard to carburetting the air, he thought this system looked very simple; and there did not appear to be, judging by what he saw on the table, much difficulty about it. In respect to the control of the quality of the pentane gas, there was this: Supposing there were two holders, and the examiner used one one night and the other next night, leaving always some of the gas he had used for his test in the holder, it would be easy for the chief gas examiner to ascertain whether the gas that had been used was up to the standard or not. For this purpose there was the duration test of Dr. Fyfe, which was 50 or 60 years old. If with this apparatus they had a standard flame of, say, 2 or 3 inches high, burning from a meter a fixed quantity of gas, this fixed quantity would last for so many minutes or fractions of a minute, according to its quality, whether it was a richer or poorer gas. With regard to the candles, those made by Miller or Bracknell and Turner were made from the spermaceti

whale, with a little wax to break the grain. They were practically pure spermaceti candles; and he did not think the variations in the results obtained with them were so much due to the spermaceti as to the wicks. The wicks were sometimes stretched; sometimes they were slack; and sometimes tightly or loosely twisted. In the burning of the candles the flame turned round the wick, and either approached the disc or turned itself from it during its combustion; and the consequence was that, with a single candle, the variations were so great that it would make a difference of something like a whole candle, or even more, according to which way the wick turned.

Mr. J. Methven said one point he wished to touch upon was with regard to the large number of tests which Mr. Dibdin had made with candles. Before a new standard could be introduced it would be necessary that it should be compared with, and rated to the actual light of an average sperm candle. Now, whilst congratulating, with the other speakers, Mr. Dibdin upon the results of his laborious investigation, he must, in the most friendly way, express a little regret that in taking the pentane results with candles Mr. Dibdin did not follow the customary practice of excluding all those results where the consumption of sperm was either above or below the prescribed limit stated by the Referees. He regretted it to this extent—that, had the large number of experiments been carried out according to the true letter of the instructions of the Referees, they would then have been considered a valuable means of ascertaining the value of the proposed standard. He found that Mr. Dibdin had made 454 candle tests; and out of this number 165 of them—or 36 per cent. of the tests that were recorded—had consumed their sperm either above or below the prescribed limit of consumption. They certainly had consumed the sperm above and below it to this extent; and it was rather marked. About 5¼ per cent. of the tests were actually made with a consumption of sperm of 120 grains per hour; 77 per cent. of them were under 120 grains; and 17 per cent. were over 120 grains. This seemed to him (Mr. Methven) to be a matter of considerable regret. In 1880 the Committee appointed by the Board of Trade found that the Harcourt pentane test was equal exactly to the standard sperm candle. They compared also the screen which bore his (the speaker's) name, and they found it passed the value of two Harcourt lamps or two sperm candles. In 1884 the Gas Institute Committee arrived at the same result; and Mr. Dibdin himself in 1885 also found that the Harcourt and Methven lamps agreed very closely with the standard candle—the former being equal to one and the latter to two. He could not help thinking that there was some omission in the present instance, which perhaps Mr. Dibdin would explain. He regarded as "sentimental" the feeling alluded to by Mr. Dibdin—that it was impossible to get a satisfactory result by using coal gas passed over pentane vapor; and he referred to the experiments in this direction which were included in the paper he read before the Gas Institute in 1882.

Mr. Dibdin, in reply, said he must congratulate himself not a little upon the reception of the paper he had had the honor of submitting to the meeting. There were one or two points to which he would refer. Mr. Harris thought the candles were rather unfavorably treated in the experiments, as in practice they showed considerably higher results than pentane. He (Mr. Dibdin) certainly agreed with this to some extent, because if they were to take the same candles that had been used in these experiments (as they did), and burn them in an open photometer in an open room, they obtained very different results. He used the apparatus which was well known as the Letheby bar photometer; and he conducted the experiments in absolutely the same manner as that adopted in the ordinary testing of gas. If they manipulated the candles, or attempted to manipulate the method of using them, or the place of using them, they obtained different results; and in this very fact was the greatest condemnation that candles could have. If he took the candles and burned them on the table in the room in a quiet atmosphere, he would obtain very different results from those he would obtain if he put them in a photometer, even though he might use a Letheby bar; and they would also be different if he burnt them in an Evans or Imperial Standard photometer. If he burned candles in another way, or pressed the wicks up or down, he should get totally different results; and therefore he quite agreed with Mr. Harris in saying that probably he (Mr. Dibdin) had arrived at different results from those Mr. Harris had obtained under other circumstances. Mr. Harris also considered that what was wanted was a standard which could be easily reproduced. He (Mr. Dibdin) asserted that they had it before them. If they took any one—the pentane, Methven, or pentane Argand—it was easily reproduced. Mr. Harris seemed to think that with the pentane standard the test could not be verified. This was exactly what could be done with the pentane. They burnt a definite gas instead of a coal gas of perhaps varying luminosity; so that they could reproduce the light as often as they pleased. Some of the gas, in Mr. Harcourt's arrangement, could be left in the holder; and this sample of gas could be used to verify former observations—a desirable result from a legal point of view. As to the advisability of the standard being 16 candles, he (Mr. Dibdin) had held this view for a long time past; and this was one of the principal reasons that he tried to show the desirability of using the 16 sperm candle standard employed by the late Mr. Keates. He had not the slightest hesitation in accepting a 16-candle standard pentane Argand. This pentane Argand had been enlarged, as Mr. Sugg had said, to a 16-candle standard. The plea which had been urged for candles was rather amusing, perhaps, to old photometrists. It was well known that if the same candle was tested under varying conditions, different results would be obtained; and the results really had nothing to do with the question of the purity of the candles. It had much more to do with the wick, combined with the temperature of the atmosphere. As to Mr. Hehner's remarks, he (Mr. Dibdin) did not agree with him as to the composition of the pentane gas, as it was now really one of the simplest things imaginable to make it. He had some trouble in making it at first; but he had given up all thought of difficulty since he used the pentane pipette previously described, and it was, as he had said, one of the simplest things in the world. As to the quality of the gas, this had been settled by Mr. Harcourt; because he said that if the gas was properly made a 2½-inch flame would be produced from the standard pentane burner by the combustion of 0.5 cubic foot per hour. As to the height of the flame, this was as simple as it could possibly be. He (Mr. Dibdin) was much obliged to Mr. Hehner for his expression of opinion as to the pentane Argand being preferable to the other standards. Mr. Foster reminded them of the error of candles, as shown by their continually increasing their indications when used in an Evans photometer—a result almost invariably experienced when using that instrument. In consequence of the attention of the Gas Referees being drawn by him (Mr. Dibdin) to the imperfections of this photometer, he was glad to say that they would no longer prescribe its use, as they could now get much better instruments. There was the Imperial photometer, which would give identical results to the simple open bar. Mr. Livesey agreed with his (Mr. Dibdin's) conclusions, but considered that a 16-candle standard would be better than a 10-candle one. This opinion, as already stated, he entirely indorsed. Mr. Sugg referred to the flame of the burner being at the end of the bar; and he thought that probably some of these results would not have been so erratic if the center of the candle flame had been carefully adjusted to the end of the bar. But he (the speaker) must say that every possible precaution had been taken to insure the utmost accuracy in the work; and this remark also applied to the observations of Mr. Methven. The men who were engaged on these experiments were men who nightly carried out the instructions of the Gas Referees; and they conducted the tests in the most conscientious manner—having done all that was possible in order to get accurate results.

Mr. Methven observed that he did not mean to cast any reflections whatever on the men who conducted the tests.

Mr. Dibdin said there was one other point, and that was the criticism in regard to candles giving high results. He should like those gentlemen who considered that these results might be erratic to consider this point. Taking 100 tests of a 3-inch Argand flame, how many of these results would be under 16 candles when tested by candles, and how many above 16 candles? They would find that possibly 99 per cent. were above 16 candles. It was the characteristic of the candles themselves that, when they went wrong, they always gave higher results. Of course, there were exceptions to the rule, but these were few and far between. With regard to Mr. Methven's criticism as to the results afforded by candles when burning within the prescribed limits, he (Mr. Dibdin) had given in his published report all the results obtained; and a careful examination of these would show that candles gave equally erratic results when burning either above or below or within the fixed limits. The reason that candles gave abnormally high results in the recent investigation was, in his (Mr. Dibdin's) opinion, due to the smallness of the room in which the tests were made, as he had already shown. Mr. Methven objected to "sentimental" reasons for rejecting a simple coal gas flame in any form as a standard. He (Mr. Dibdin) had reason to know that with the public mere sentimental objections often took the place of more important ones; and it behooved experts to hesitate before unnecessarily giving cause for objections—sentimental or otherwise.

A vote of thanks was then passed to Mr. Dibdin.

It is said that the Knoxville (Tenn.) Iron Company has arranged with the Smith-Loughran Company to substitute the latter's fuel gas for coal for heating the furnaces. The change will involve a large expenditure of money.

Output of Coal in the United States, 1887.

Through the courtesy of Mr. Chas. A. Ashburner, assistant in charge of coal statistics, United States Geological Survey, we are enabled to place the following facts in respect of quantity and value of coal mined in this country during the past year.

The statistics have been compiled principally from the direct returns of the operators of individual coal mines, and of railroad agents, supplemented by valuable facts contributed by State officials.

The total production of all kinds of commercial coal in 1887 was 123,965,255 short tons (increase over 1886, 16,283,046 tons), valued at the mines at $173,530,996 (increase, $26,418,241). This may be divided into Pennsylvania anthracite, 39,506,255 short tons (increase, 2,809,780 short tons), or 35,273,442 long tons (increase, 2,508,732 long tons), valued at $79,365,244 (increase, $7,807,118); all other coals, including bituminous, brown coal, lignite, small lots of anthracite produced in Colorado and Arkansas, and 6,000 tons of graphitic coal mined in Rhode Island, amounting in the aggregate to 84,459,000 short tons (increase, 13,473,266 tons), valued at $94,165,752 (increase, $18,611,123).

The colliery consumption at the individual mines varies from nothing to 8 per cent. of the total output of the mines, being greatest at special Pennsylvania anthracite mines, and lowest at those bituminous mines where the coal bed lies nearly horizontal, and where no steam power or ventilating furnaces are used. The averages from the different States vary from $2\frac{1}{10}$ to $6\frac{1}{7}$ per cent., the minimum average being in the Pennsylvania bituminous, and the maximum average being in the Pennsylvania anthracite region.

The total output of the mines, including colliery consumption, was: Pennsylvania anthracite, 37,578,747 long tons (increase over 1886, 2,725,670 long tons), or 42,088,197 short tons (increase, 3,052,751 short tons); all other coals, 87,837,360 short tons (increase, 14,129,403 tons), making the total output of all coals from mines in the United States, exclusive of slack coal thrown on the dumps, 129,925,557 short tons (increase, 17,182,154 tons) valued as follows: Anthracite, $84,552,181 (increase, $8,433,061); bituminous, $97,939,656 (increase, $19,458,600); total value, $182,491,837 (increase, $27,891,661). The above figures show a notable increase in 1887 over 1886 in the aggregate output and value of both anthracite and bituminous coal.

The total production and the spot value in each State and Territory, exclusive of colliery consumption, are shown in the following table:

States and Territories.	Quantity. Short Tons.	Value at Mines.
Pennsylvania—		
Anthracite	39,506,255	$79,365,244
Bituminous	30,866,602	27,806,941
Ohio	10,301,708	9,096,848
Illinois	10,278,890	11,152,596
West Virginia	4,836,820	4,594,979
Iowa	4,473,828	5,991,735
Maryland	3,278,023	3,114,122
Indiana	3,217,711	4,324,604
Missouri	3,209,916	4,298,994
Kentucky	1,933,185	2,223,163
Alabama	1,900,000	2,470,000
Tennessee	1,900,000	2,470,000
Colorado	1,791,735	3,941,817
Kansas	1,596,879	2,235,631
Wyoming	1,170,318	3,510,954
Virginia	825,263	773,360
Washington Territory	772,612	1,699,746
Indian Territory	685,911	1,286,692
New Mexico	508,034	1,524,102
Georgia	313,715	470,573
Utah Territory	180,021	360,042
Arkansas	150,000	252,500
Texas	75,000	150,000
Michigan	71,461	107,191
California	50 000	150,000
Oregon	31,696	70,000
Dakota	21,470	32,205
Montana	10,202	35,707
Rhode Island	6,000	16,250
Nebraska	1,500	3,000
Idaho	500	2,000
Total	123,965,255	$173,530,996

Spontaneous Combustion.

La Nature, in the course of an exceptionally interesting article on this subject, goes on to say that in November, 1887, a corps of firemen boarded the steamship City of Newcastle, on her arrival at Liverpool, for the purpose of extinguishing a fire in the cargo of cotton which comprised her freight load, the fire having been traced to spontaneous combustion. An unsuccessful attempt to quench the outbreak had been made at Queenstown, the first port made by the vessel from her place of clearance.

Our authority then explains that baled cotton, and also cotton and firers and rags that are saturated with oil, are quite subject to spontaneous combustion. In five years 46 ships bound for Liverpool alone, and loaded with cotton, were burned either at sea or just before or after their departure. This figure is much too low, judging from the remarks of a rich English banker who is familiar with affairs in all parts of the world. Of the long list of vessels laden with cotton or grain, 9 have just been burned in whole or part, and he added that it was necessary that steps should be taken to prevent the fermentation of cotton, which appeared to be more combustible at that period than usual.

The remarkable tendency which is observable in tissues and cotton, when moistened with oil, to become heated when oxidation sets in, deserves particular attention, and especially so from the sad results that may follow negligence, caused too often by ignorance of the danger or ignorance of the necessary precautions. In the navy, for instance, every precaution is taken to avoid spontaneous combustion. Thus, all the officers are aware that before packing away the tarpaulins or oiled coats which the sailors wear in bad weather, it is necessary to see that they are thoroughly dried. They should not be packed together in too great numbers. Oils, when drying, undergo a change which is simply a slow combustion at low temperature. If this action is hastened by any cause whatever, it brings about a higher temperature, which may result in fire.

The experiment may be made of producing spontaneous combustion, even in a few yards of cotton cloth, by painting it with linseed oil. M. Chevalier cites an instance of this nature, in the sail room at the arsenal at Brest, where three cases (for sails) of canvas painted with oil had been laid one on the other, after having been dried in the sun two days. Each piece measured about 10 yards. Whether in the sun or shade, or under cover or exposed to the air, these pieces of fabric, whether yarn or cotton, can readily take fire, but fortunately very soon attract attention from the dense smoke that is emitted. Cotton fabrics containing oil, however, do not alone take fire in closed chambers and in the holds of ships, for I have seen the phenomenon produced in open air. I witnessed a case in point near the railroad station of l'Ouest, in July, 1878, when the heat was very great. The lamp room is situated at the foot of the Rue de Rome and the Pont de l'Europe. There, in a large sack, were gathered all the useless, greasy rags that had been used for cleaning the lamps. One of these bags had been filled so full that the rags had fallen to the ground, and as I passed by I noticed an odor of burning rags, but after a careful examination discovered no cause for this. Passing the same place five minutes later, I found the odor stronger, and I discovered the rags were just bursting into fire. I called an attendant and showed him the fire, and it was very soon extinguished with the help of a pail of water.

M. Chevalier, in his memoir on fires, instances the experiments of Messrs. Golding and Humphries, who caused spontaneous combustion by shutting up a piece of fabric immersed in linseed oil in a closed box, where it was left for three hours. The fabric commenced to smoke, and as soon as the air was admitted burst into flame.

Messrs. Renouard and Rouen carried still further the experiments of Golding. They mingled a few pieces of oiled cotton with some dry cotton, and then put the whole under pressure, and after a few hours fire was discovered. Everyone is aware that when cotton is baled, it is subjected to an enormous pressure. If the cotton is greasy, or even damp, it ferments, becomes heated, and then ignited.

A curious instance was reported by Dumas to the Institute in 1844, and cited by M. Fonssagrives. An artist was rubbing with a wad of cotton a painting freshly varnished. When he threw the cotton away, it immediately took fire in mid-air. Later, at the Academy of Sciences in 1879, during a discussion concerning a fire in the floor of a laboratory of a certain botanist, M. Cosson, M. Dumas cited a number of cases which prove that the condensation of the air in porous and combustible bodies frequently produces combustion, if the temperature is sufficiently low. Among these he again cited the case of the wad of cotton taking fire in mid-air. A savant as prominent as Dumas, who repeats the same statement at an interval of 30 years, classes it evidently as an indisputable fact. The temperature of 80° or 100° in the hold of a vessel does not sufficiently explain the cause of a fire in a cargo of damp linen, hemp, manure, oats, grain, or cereals. It is necessary to take into consideration the changed conditions. The rise in the temperature is due to the condensation of gas and to the rapid and powerful oxidation. Thus charcoal, which is very porous, when shut in a closed atmosphere absorbs a large proportion of gas, which condenses and produces heat,

I cite another case, not so well known: The waste from vulcanized rubber, when thrown, in a damp condition, into a pile, takes fire spontaneously. This occurred at the factory of M. Menier, at Grenelle, in France.

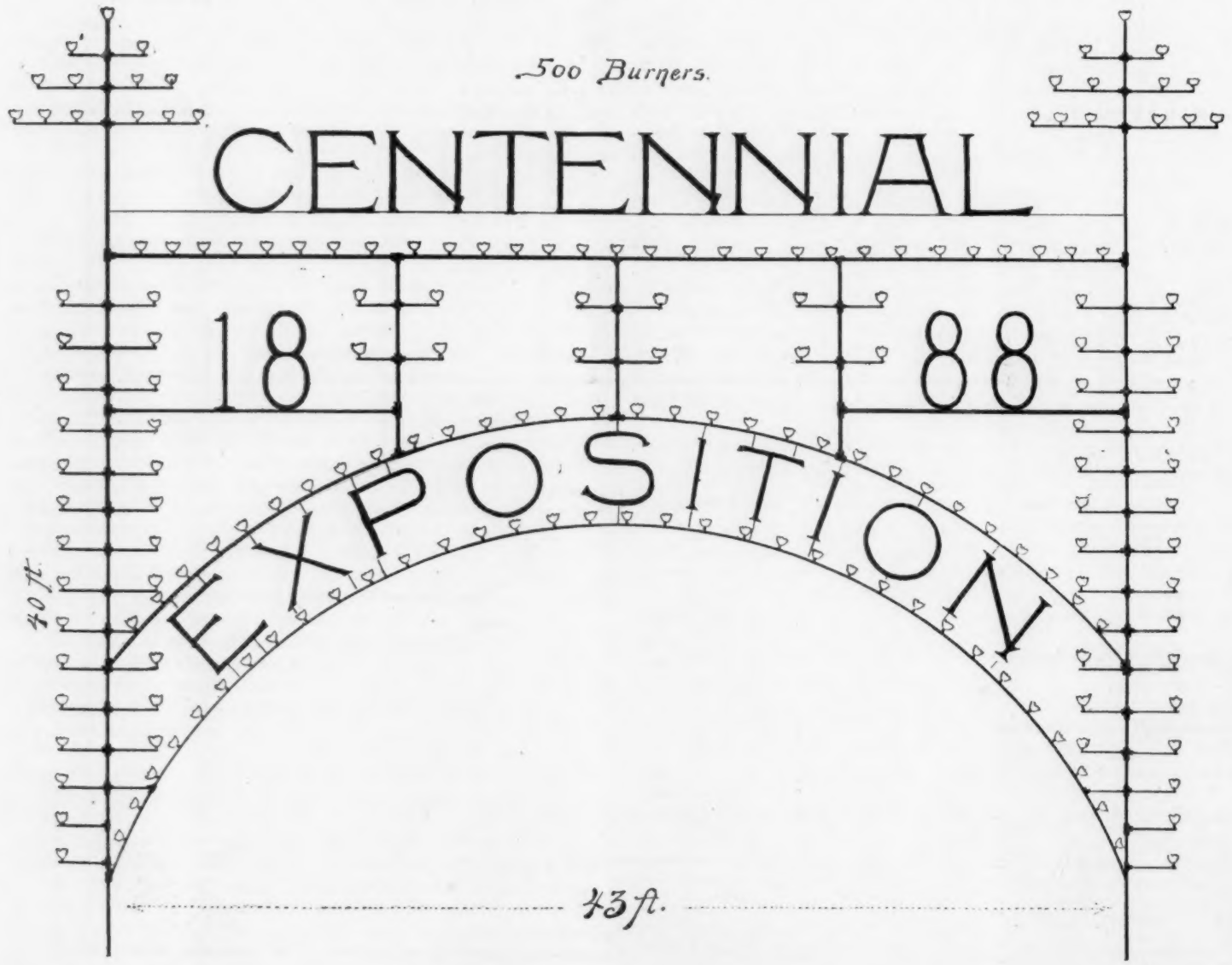
Messrs. Dumas and Chevreul, in treating of this subject of spontaneous combustion before the Institute, stated that when a package from China containing some fre h vegetable matter and some dried substances was opened, they took fire, even before their eyes.

M. Fonssagrives states that the temperature of boxes of figs from Barbary has been so raised by fermentation that you could hardly bear your hand upon them.

There is less surprise in the increase of heat in heaps of coal, whether in storage or in open air. These masses of coal, whether in the quay or in the yard, take fire, nevertheless, without a spark being applied. The complex composition of coal gives a sufficient cause for spontaneous combustion. It contains essential oils, sulphur, and, above all, phosphuretted hydrogen and marsh gas, which is spontaneously combustible. The impalpable coal dust also adds another danger of combustion.

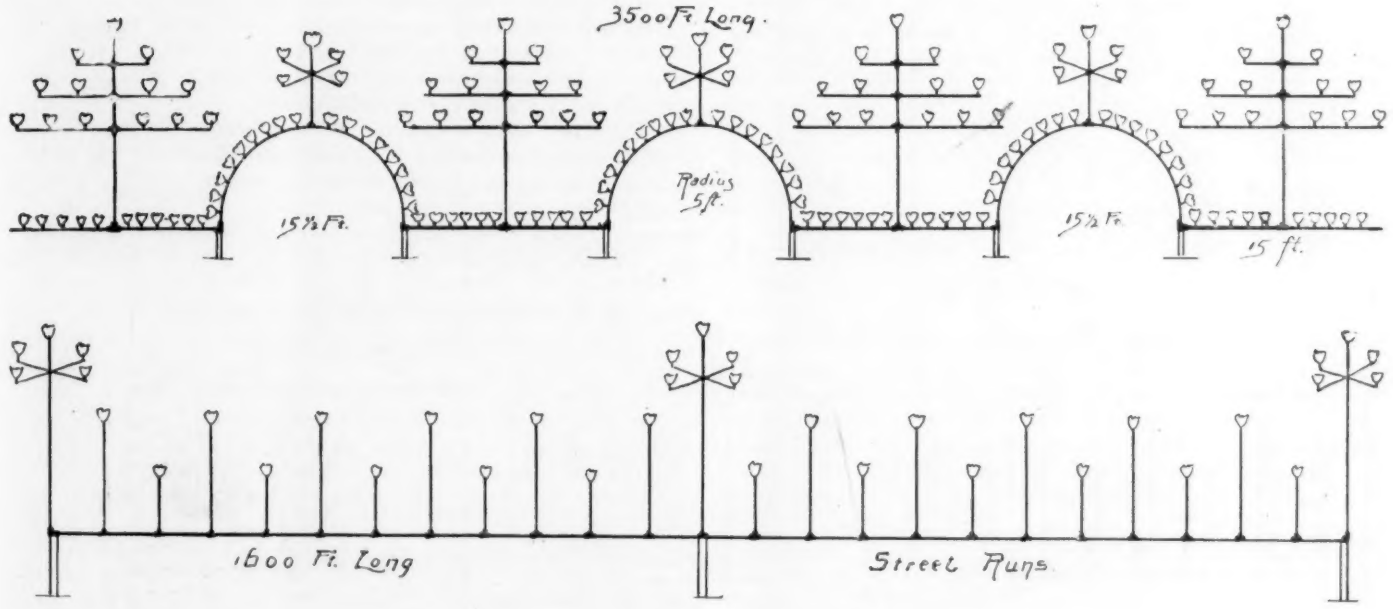
Cincinnati's Illuminated Exposition.

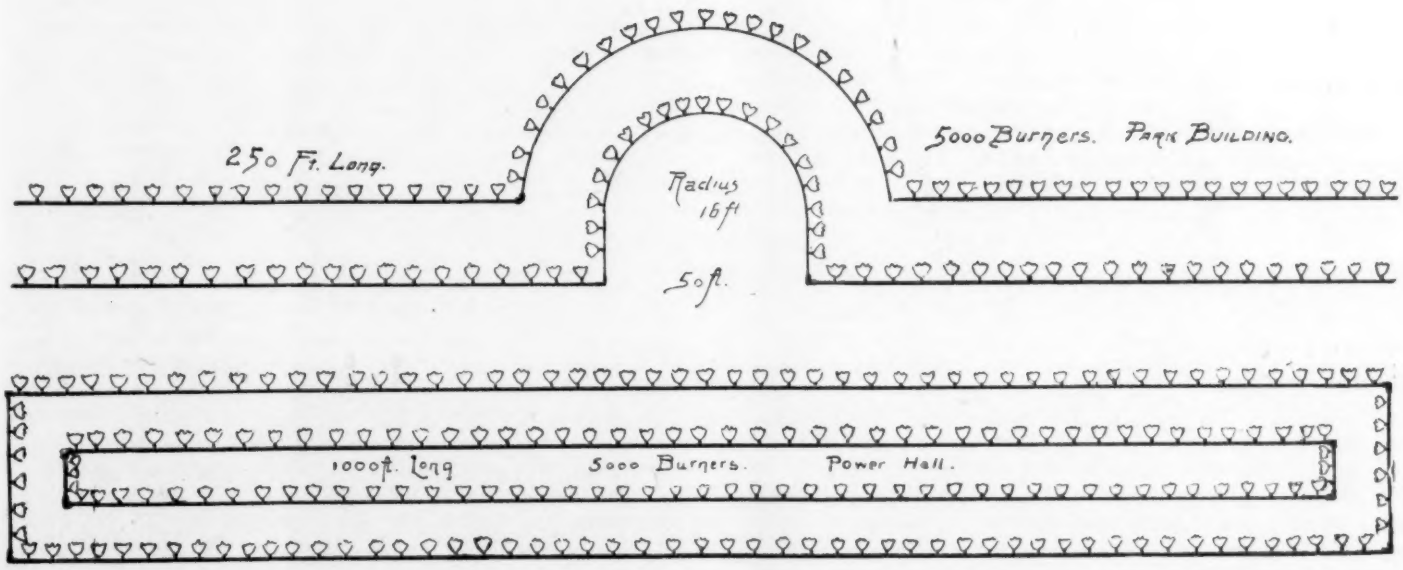
If the spirit of the leader of the hardy band of pioneers who, in 1788, upraised their rude log cabins on the north bank of the Ohio river just opposite the muddy mouth of the erratic Licking stream, could visit Cincinnati on next Independence Day, the visitor from the great unknown might be excused for marvelling much at the changes wrought by the pluck and enterprise of those who took up and carried on the burden. And it is also not to be wondered at that the present denizens of the Queen City, remembering that their wide-spreading, briskly-bustling abiding-place stands on the threshold of rounding out her first even hundred of years, wish in appropriate manner to celebrate this to them eventful epoch in the flight of time. How better could such wish be carried out than by providing means for an appropriate display of the resources of their city, to which display also the entire population of the Buckeye State was asked to contribute. Thus is the tenacity of the pioneers glorified, and at the same time the men of the day are enabled to prove that the spirit of their ancestors still moves them on to the harvest of an enlarged civic conquest. With the plan of celebration once mapped out, the energies of all were enlisted to cause the result to be on a scale commensurate with the occasion. Individuals were asked to contribute their mite, and the corporations—although at times considered soulless by the individuals—were invited to add their—"mass," may I call it. At any rate, the "mites" and the "masses" rapidly rolled into the treasury; and I may be forgiven for indulging in the prediction that the coming Cincinnati Centennial Exposition of the wonderful and varied resources of the Buckeye State shall be naught else than a grand success. The



permanent building on Elm street facing the Park was, of course, inadequate to the task of housing all who desired to show what Ohio is doing in the varied branches of agriculture, mining, commerce and art, whereupon it was decided to cover the Park with temporary structures, connecting these, by means of a bridge thrown over Elm street, with the permanent building. Then came the question of how the buildings, grounds and approaches could be illuminated. In the midst of the cogitation in stepped a man, whom thousands long ago cheered as "Little Andy"—General Hickenlooper—the head and front of that most hardened of all soulless corporations—a gas company—who claimed the right to turn darkness into light. Not to be too precise about it, the General said it would give his Company pleasure to contribute its share to Cincinnati's Centennial glorification; and the managers accepted the Cincinnati Gas Company's "mass" contribution to the Exposition's welfare. Superintendent of Distribution, Mr. Henry Felt, and the General put their heads together, and the result of their cogitation is shown in the

diagrams herewith presented. The drawings are so plain in their story that any extended reference to them would seem like carrying coals to Newcastle. However, the main arches—those carrying the lettering and figures—of which there are to be 10, are distributed appropriately. Perhaps the greatest effect from these will be obtained on the building front facing Canal street, on the south, southwest and east points. The arches here will be 70 feet in height. The street runs, as shown, are aligned on Elm, from 12th to 14th; on Race, from 12th to 14th, and on 12th from Race to Plum; the illumination being carried on both sides of the respective streets between the points named. The street intersections are provided with double canopy arches; the temporary bridge will be a thing of much beauty, the smaller designs in this portion of the illumination having been wrought out with great effort for scenic effect. All





the jets, and there are certainly not less than 20,000 of them, are inclosed in fancifully-colored globes. The plan of the interior illumination—that is, in the temporary buildings and in Power Hall in the permanent building—is graphically shown in the last two diagrams. Those who are curiously inclined may figure out to their own satisfaction how large a quantity of tubing was used in carrying out this scheme, and they may add thereto an estimate of the value of the gas which will be consumed during the 90 odd days that the Exposition is to remain in progress. Having added the two sums they will have an idea of the money value of the Cincinnati Gas Light and Coke Company's contribution to the Queen City's glorification of her one hundredth birthday. General Hickenlooper and his efficient aide, Mr. Felt, certainly ought to be warmly congratulated on the success of their efforts; for such was only gained by downright hard and persistent labor. D.

The Griffin Gas Engine.

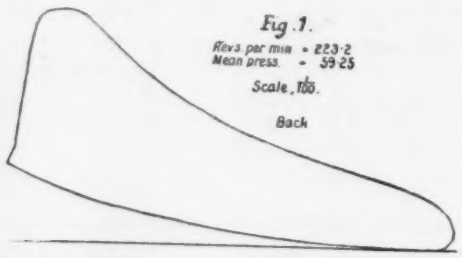
The Griffin gas engine, which is attracting no little attention abroad, is of the three-cycle type—that is, three double strokes of the piston are required to draw in a charge, compress it, and effectively evacuate it. In the larger sizes the cylinder is double-acting, the charge being received in front as well as at the back of the piston, and as this arrangement permits of the cycle going on at both ends of the cylinder simultaneously, the result is that there is an explosion at each revolution and a half of the crankshaft. In the smaller sizes two single-acting cylinders are used side by side, the explosions in the two being separated by an interval equal to one and a half revolutions of the shaft. In the smallest size of all there is one single-acting cylinder.

In the 8-horse power nominal engine, which has a cylinder 9 in. in diameter by 14 in. stroke, there are two admission valves, one for each end, at one side of the cylinder, and two exhaust valves at the other side. With each admission valve there is combined a Griffin ignition apparatus. The cycle of operations is as follows: The burnt gases from the last explosion having been discharged, the piston, on going forward, draws in a scavenger charge of air, and on the return stroke the exhaust valve is opened, so that this charge may be swept out. The piston then goes forward again, and this time draws in combustible mixture, which on the second return stroke is compressed in the usual way. The ignition occurs at the beginning of the third stroke of the cycle, and the burnt gases are expelled on the return of this stroke. The same series of events takes place at each end of the cylinder. The governor acts, as in the Otto engine, by entirely cutting off the gas when the

speed is too high. An explosion every cycle can, however, be obtained as long as the engine is developing more than half its power, by throttling the gas between the meter and the engine. This arrangement insures more regular running than is obtained by the action of a hit-or-miss governor, and is especially valuable for electric lighting purposes.

Several Griffin gas engines have lately been tested by Professor Alex. B. W. Kennedy, F.R.S., M. Inst. C.E., M.I.M.E., University College, London, and the results of the trials have been embodied in a report, to which we are indebted for the following information.

The first series of experiments was with an 8-horse power (nominal) engine, with two flywheels, each of which was fitted with a strap brake encircling half the circumference of the wheel, and having a weight at one end and a spring balance at the other. There were four principal experiments with this engine. The first two, of two hours each, form really one continuous four hours' run, driving the two brakes. In the first the speed was somewhat the greater, in the second the weights on the brake were the greater. The two periods gave practically identical



results as to economy, and for the calculations the mean figures of the two runs were taken. The third trial lasted one hour, driving a dynamo. The fourth trial was for half an hour at half power, but with the gas so far throttled that there were no governor misses. The results of these four trials are given in Table I.

Lines 23 and 24 show the gas consumption, which at full power varied from 18.87 cu. ft. to 18.96 cu. ft. per indicated horse power, and from 23.5 cu. ft. to 23.66 cu. ft. per brake horse power. At half power these figures became 25 cu. ft. and 37 cu. ft. respectively. Figs. 1 and 2 are indicator cards taken during the working and pumping stroke from one end of the cylinder, the former taken with a $\frac{1}{100}$ spring and the latter with a $\frac{1}{10}$ spring. The very rapid cooling of the gases at release causes the pressure at the end of the stroke to fall below the atmosphere A (Fig. 2). During the rapid ejection of the hot gases, however, the pressure rises considerably above the atmosphere (B), falling again as the velocity of the piston decreases (C). There is a similar rise of pressure (D) during the discharge of the scavenger air. Both the scavenger charge and the working charge are drawn in (E) at a pressure of about 1 lb. per square inch below the atmosphere. The whole work done during these two strokes is equivalent to a reduction of 3.54 lbs. per square inch in the mean effective pressure on the working stroke. In the fourth trial (column 5) the gas was so much throttled that it only amounted to about $\frac{1}{15}$th of the charge. The combustion was very slow (Fig. 3), but the running of the engine was perfectly regular.

The next set of trials related to a 2-horse power engine, with two single-acting cylinders working on a double crankshaft, the two cranks being about 180° apart. The cylinders were each 5¾ in. in diameter by 10 in. stroke.

Three tests, each of one hour duration, were made, and the chief results are given in Table II.

TABLE II.—*Experiments on 2-Horse Power Twin Engine.*

	First Trial.	Second Trial.	Third Trial.
1. Duration of trial	1 hour.	1 hour.	1 hour.
2. Number of indicator cards taken from each cylinder	4	4	4
3. Average initial pressure (above atmosphere)	137.2	148.6	159.2
4. Average mean pressure during working stroke	50.3	54.4	58.6
5. Average mean pressure during pumping stroke	2.3	2.3	2.3
6. Net average mean pressure (=4—5)	48.0	52.1	56.3
7. Revolutions of engine per minute	204.7	203.1	192.0
8. Explosions per minute	135.9	135.4	128.0
9. Indicated horse power (working stroke card)	4.48	4.83	4.92
10. Indicated horse power, net	4.28	4.63	4.73
11. Gas used per hour (without ignition)	102.	115.	117.5
12. Gas used per indicated horse power (line 9) per hour	22.75	23.80	23.88

TABLE I.—*Experiments on 8-Horse Power Engine.*

	1.	2.	3.	4.	5
1. Nature of resistance	*Brake.*	*Brake.*	*Mean of Columns 1 and 2.*	*Dynamo.*	*Brake.*
2. Power	*Full.*	*Full.*		*Full.*	*Half.*
3. Duration	2 hours.	2 hours.	4 hours.	1 hour.	30 min.
4. Number of indicator cards taken from each end of cylinder	8	8	16	6	6
5. Average initial pressure above atmosphere	135.8	142.9	139.3	149.4	.....
6. Average mean pressure during working stroke	56.19	57.24	56.71	59.00	36.1
7. Average mean pressure during pumping stroke	3.54	3.54	3.54	3.54	
8. Net average mean pressure (6–7)	52.65	53.7	53.17	55.46	
9. Revolutions of engine per minute	228.7	218.9	223.8	210.4	215.5
10. Nominal explosions per minute	152.5	145.9	149.2	140.3	143.7
11. Actual explosions per minute	151.8	145.8	148.8	140.3	143.7
12. Indicated horse power for working stroke card	18.82	18.42	18.62	18.26	11.45
13. Indicated horse power for net working stroke card	17.64	17.28	17.46	17.17	.....
14. Large weight on brakes ..... lb.	178.12	206.12	.....	.....	98.25
15. Small weight on brakes ..... lb.	52.82	78.62	.....	.....	29.9
16. Mean radius of weight ..... in.	33.3	33.3	.....	.....	33.1
17. Brake horse power	15.13	14.75	14.94	.....	7.72
18. Electrical horse power	.....	.....	.....	10.3	
19. Mechanical efficiency of engine, or ratio of brake to net indicated horse power ..... p.c.	85.8	85.4	85.6	.....	
20. Gas used per hour (without ignition)	355.5	349,0	352.2	354.5	28.6
21. Pressure at meter ..... in.	1.4	1.55	1.47	2.1	2.15
22. Temperature at meter (Fahr.) ..... deg.	66.6	67.4	67.0	60.5	60.2
23. Gas per indicated horse power (line 12) per hour	18.89	18.96	18.92	18.87	25.0
24. Gas per brake horse power per hour	23.5	23.66	23.58	.....	37.0

On the first test the engine drove two small dynamos, one from each flywheel, one working 16 and the other 32 lamps, each of 16-candle power. These machines were not sufficient to take up the whole power of the engine, so that the governor cut out a few explosions at first. The gas was then throttled until the governor ceased to suppress explosions, and the engine ran perfectly steadily without missing. The indicated horse power was 4.48, and the gas consumption 22.75 cu. ft. per indicated horse power.

A large dynamo was then substituted for the smaller ones, and worked through resistances to the maximum which the engine could drive at full speed. The indicated horse power went up to 4.83, and the gas consumption to 23.8 cu. ft. per indicated horse power per hour. The third run was against a slightly increased resistance at a somewhat slower speed, and the gas consumption was 23.9 cu. ft.

From the figures given above it will be seen that the Griffin gas engine has many points which will recommend it to engineers and users. It is exceedingly economical of gas, 23.6 cu. ft. per brake horse power per hour being a very striking performance. The figure for the 2-horse power engine—22.75 cu. ft.—has scarcely ever been equaled before. The running of the engine is exceedingly steady, and it needed very sharp scrutiny to discern any fluctuation in the light cast by the glow lamps fed from the dynamos driven by the engine. The possibility of being able to immediately adjust the gas supply to give a regular succession of explosions is a very valuable feature, and removes one objection to the use of gas engines. Professor Kennedy speaks in terms of high commendation of the general design and of the running of the engine, which gave no sign of distress after several hours continuous work.

[Prepared for the JOURNAL.]

A Visitor's Impressions at the Gas Institute Meeting, London, 1888.

As a preliminary to my visit to the place of meeting at Great George street, Westminster, I availed myself of an opportunity, afforded by the kindness of a friend, of glancing over the published transactions of the Gas Institute. The Association was originally formed, by Gas Managers, in 1863, and existed for 18 years under the title of "The British Association of Gas Managers;" but in 1881 it was felt that this title was no wide enough for a Society desirous of representing the whole gas industry, and the present one was accordingly adopted. At that date the Association comprised 675 members of all classes; now it numbers 823, including 22 honorary, 606 ordinary 60 extraordinary and 31 associate members, also 104 associates. Looking at the fact that the associate class was only created in 1881, the actual increase in members appears small as compared with the advance in the prosperity and extent of the gas industry during the last seven years. This may be due to two causes —an increased subscription and the development of district associations. The annual contribution has been increased from half a guinea to one guinea, without offering any corresponding advantage—such at least is the opinion freely expressed amongst the members, and which is supt ported, to some extent, by the fact that for two years the Council have had to report a decrease in the roll call. Looking at the number of gas works, and the amount of capital invested therein, in the United Kingdom, one might reasonably expect that the various classes of membership offered by the Gas Institute should comprise some 2,000 or 3,000 names. This suggests whether the six District Associations, which retain the gas manager association element pure and simple, are not to some extent carrying out the objects aimed at by the originators of the British Association of Gas Managers. So far as I can learn they are not wanting in that healthy growth which might reasonably be looked for under present circumstances, and the lack of which is so conspicuous in the affairs of the Gas Institute.

When the Gas Institute was formed in 1881 there was a general impression amongst gas circles that something should be done in the way of advertising the uses of gas. The Gas Institute undertook to champion the cause of gas in the Electric and Gas Exhibition, held at the Crystal Palace, in 1882–3, and with the aid of some £6,000, contributed by gas companies, they carried out this work in a satisfactory manner. It was then hoped that gas companies would become annual subscribers to the Institute. But this hope has not been realized, and at present the sources of income are little beyond the members' subscriptions. In short, the Gas Institute is nothing more than the original Gas Managers' Association, shackled with a class of associates, most of whom find it worth while to pay their guinea per annum in return for the privilege of touting for orders amongst the members at times when attention is supposed to be directed to the business proper of the meeting. To such an extent is this practice carried that at previous meetings the President has repeatedly had to call for order in the vestibule and entrance, the buzz of conversation being sufficient to drown the speakers' voices. From what I witnessed at this meeting it may be questioned whether the title of "Gas Exchange" would not be more suitable. The room was crowded at the commencement of the meeting, to hear the debate on a proposition made by the Council for the expulsion of Mr. Geo. Bray, the well-known maker of gas burners, from the Institute.

It appeared that Mr. Bray persists in disturbing the meetings by bringing forward certain matters involving grave charges against prominent members of the Institute, and also avails himself of the medium of the press in publishing these accusations. The Council felt their only course to be either the expulsion of Mr. Bray or their own resignation; and after an animated debate, in the course of which Mr. Bray was warmly championed by Mr. Sellers of York, a ballot box was brought into requisition, and 126 votes were recorded in favor of the proposition, and 62 to the contrary. He was accordingly declared to be expelled.

After this unpleasant business, proceedings of a more harmonious nature followed. The Societe Technique du Gas en France having held their usual meeting at Boulogne a few days previously, had made up a strong detachment, numbering about 120, for the purpose of visiting London and attending the Gas Institute meeting. The presence of this body was alluded to by the President in appropriate terms, and Mr. Ellisen, of Paris (President of the French Society), was invited on the platform and introduced to the meeting, which received him with loud and prolonged applause. To this he responded with a speech delivered in excellent English.

These hearty expressions of mutual congratulation and goodwill having been exchanged, it became evident that another pleasure was in store for the members—at least it will not be too much to say this, after hearing the tumultuous burst of acclamation which greeted the appearance on the platform of a gentleman not unknown to English gas managers. This was Mr. Geo. Shepard Page, of New York, who, stepping forward with a genial smile on his countenance and an official document in his hand, was introduced as a delegate from the Western Gas Association, U. S. A. I need not add that the satisfaction of the meeting was by no means abated when it became apparent that the document in question was an address, duly signed, sealed, and delivered, conveying the sentiments of the Western Association to the meeting. It was read in excellent and forcible style by Mr. Page, and was followed by what I may call a pleasant little informal international meeting, in which the President (England), Mr. Foulis (Scotland), Mr. Denny Lane (Ireland), Mr. Ellisen (France), and Mr. Page (United States) took part. The latter gentleman cordially invited the attendance of members of the Gas Institute, or of the Societe Technique, at the meeting of the American Gas Light Association to be held at Toronto next October.

The President, Mr. C. Gandon, M.Inst.C.E., delivered an excellent inaugural address, passing in review a large number of topics, many of which were international in character. The paper that attracted most interest was that by Mr. W. A. Valon, of Ramsgate, who gave an account of some experiments he had conducted in the use of pure oxygen, manufactured by Brin's Oxygen Co., in the purification of coal gas. These experiments were of a very extensive character, and comprised several months' operations on a practical scale. Mr. Valon has not only applied oxygen as a means of reviving oxide of iron *in situ*, but also in connection with lime; and his results undoubtedly establish the practicability of using it in an efficient manner, provided that financial and other circumstances are favorable. Judging from the excellent discussion which followed, this subject has lately been occupying a great deal of attention in England. In fact, this was by far the best debate of the meeting, as every speaker brought out some useful practical information in connection with the subject. Mr. C. C. Carpenter, of Vauxhall, contributed an excellent paper on the principles of gaseous firing in their application to the heating of retorts, in the course of which he pointed out the disadvantages attendant upon the use of too thin or of uneven layers of fuel in the producer, as likely to result in unequal heating of the retorts, and especially in not securing a proper degree of heat at the front of the setting. In order to obtain a uniform heat, he said, the gases from all parts of the producer must be uniform in quality. The best methods of heating the secondary air supply were considered at length, and a preference expressed for cheap and simple rather than costly and elaborate regenerator arrangements. The distribution of the fuel gas in the setting was also dealt with. In the course of the discussion that followed the reading of the paper, the importance of absolute control over the air supply was insisted upon, and it was also urged that, if the retorts are heated equally from end to end, a large amount of heat must pass off with the waste gases—at any rate, a sufficient quantity to

be worth some trouble and expense to secure. In replying, Mr. Carpenter said he used about 12 lbs. of coke per 100 lbs. of coal carbonized. He was able to adjust his air supply within 0.5 per cent. of the quantity required according to theory, and his fuel gases contained 33 to 35 per cent. of combustible matter. Mr. W. J. Dibdin, Superintendent Gas Examiner to the city of London, contributed an interesting paper on photometry, in the course of which he condemned strongly the "Evans" or box form of photometer, and was the means of drawing out an interesting and animated discussion upon photometrical matters generally.

Mr. H. Woodall followed with a paper on "Differential prices," in the course of which he spoke strongly against the practice, very general in England, of charging one uniform price all round to large and small users of gas alike. This was largely due to the Acts of Parliament, which rendered it imperative that the public lamps should be supplied at the lowest rates charged to any single consumer. He contended that these acts, which were framed at a time when gas was used for lighting only, were not just under present circumstances, and referred to several recent events which showed that public feeling was moving in the direction of differential prices, and that the system of charging one price only, whether 2,000 or 200,000 cu. ft. were the quantity consumed, was simply taxing one class of consumers for the benefit of another, and as unjust as the plan of making large profits from the gas consumers in towns where the gas works belonged to local authorities, and expending those profits for the benefit of the whole community. In a forcible manner he showed that large consumers were the backbone of a gas undertaking, and that the loss of this class would render a higher price imperative: by allowing large consumers a discount, therefore, the whole were eventually benefited. Mr. Woodall condemned the sliding scale system as being opposed to differential prices. In the discussion that followed Mr. G. Livesey defended the sliding scale, but admitted the desirability of allowing a moderate discount to large consumers, and also of being satisfied when a 12 per cent. dividend or so had been obtained, with a smaller moiety of the increased profits in future; in other words of allowing more benefit to the consumer in the form of reductions in the price of gas. A plea was raised for the small consumer, but, on the whole, the speeches appeared to be in favor of a scale of discounts according to consumption. Mr. G. Shepard Page delivered a telling and amusing speech in favor of differential prices as applied in the States.

Mr. Lux gave a description, illustrated with examples, of his gas balance for taking the specific gravity of gases. Mr. J. Somerville, of London, read a paper on the ventilation of gas lighted rooms. And Mr. Leeds contributed an instructive and interesting description illustrated by experiments, of his gas heating stove, and the principles of its construction. The lighter portions of the proceedings comprised a conversazione at the Grosvenor Gallery, a visit to Beckton gas works, and an excursion to Portsmouth dockyard.

During the past year the Council of the Institute have been considering the advisability of adopting uniformity of thread and size for meter connections, and have recommended the adoption of the Whitworth thread, and a fixed series of diameters for the various sizes of meters. The subject of education in gas manufacture, etc., has received a great deal of attention, and a scheme for encouraging the foundation of classes and lectureships in different parts of the country was agreed upon and accepted by the meeting. The Council are prepared to make grants not exceeding one-half of the total expenditure. I have now given an outline of the principal proceedings at the recent Gas Institute meeting. In conclusion, I would remark that the hearing of papers and the subsequent discussions evidently have no attractions for many of the members. At no time during the progress of that part of the proceedings was the attendance so good as during the conclusion of routine business, and some of the papers were read to almost empty benches. As it was, the time devoted to this department did not exceed six hours. The cause of this is not far to seek. In England coal gas is so cheap that neither water gas, oil gas, nor electricity can touch it in the matter of price. Secure under the Parliamentary enactments, there is no fear of competition. It may be questioned whether things are not too comfortable, and if a little opposition would not bring about a more wholesome degree of activity.

Mr. J. B. Howard, of Dubuque, Iowa, sails for Europe on Thursday next, on the State Line steamer Pennsylvania. Mr. Howard has well earned a vacation, and we trust, and his many friends will echo the sentiment, that his trip may be enjoyable in every sense. So may it be.

We regret to announce the death, on June 26, of Mr. Joseph H. Collins, Jr., Phila., Pa., late Assistant General Superintendent of the United Gas Improvement Company. Deceased, who had not completed his 35th year, was an exceptionally bright and faithful employee of the Company. The funeral services were held at his late residence, 2034 Tioga street, Phila., Pa., on last Friday evening. We believe that a sunstroke was the cause of his death.

Stryckland & Symons, 18 Toronto street, Toronto, Can., are receiving bids for the several works required in the erection of a meter house and office building for the Consumers Gas Company of Toronto.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

The Asheville (N. C.) Works in New Hands.—Messrs. Jno. Wotherspoon—who is known to the trade as being the best theatrical gas fitter in this city—and W. H. Taylor, formerly in charge of the Knickerbocker station of the Consolidated Gas Light Company, have leased the works of the Asheville Gas Company. They will make important changes in the plant, and the venture ought to prove remunerative. We wish them every possible success.

A Hint from Stratford, Ontario.—When the proposition to establish a gas works at Stratford was first mooted, in 1873, considerable difficulty was experienced in inducing capitalists to invest the capital necessary to carry on the enterprise. Two years afterwards the works were put in operation, and now many of the local financiers are sorry that they did not get in on the ground floor. When gas was first turned on the Company owned only 9,613 feet of mains, but now it can boast of a main system not less than 6½ miles in extent, a goodly portion of which is 10-inch. Last year the total sendout was about 6¼ millions cubic feet. About 6 months ago an arc light plant was installed—capacity, we believe, 60 lights—from which 45 lights are being supplied to ordinary or domestic consumers. The City Council are now considering the advisability of substituting electricity for gas in the instance of public lighting, and it is more than probable that the change will be made. In this event the Stratford gas men will be obliged to increase the capacity of their dynamo station. The capital seat of Perth county is growing steadily in population and importance as a commercial center, in evidence whereof we have only to say that it now contains 7,500 inhabitants, as against 4,313 in 1880.

We regret to say that Mr. Aaron Thompson, who for nearly a third of a century (since 1857) has acted as Treasurer of the Woburn (Mass.) Gas Light Company, died at his home in Woburn on June 18th. Deceased was a remarkably reserved man, although signally popular with his fellow citizens. While these statements seem pronouncedly antithetical, they are nevertheless strictly true; for on one occasion he was almost unanimously chosen by the voters of Woburn to fill the position of Selectman, but when notified of the fact, Mr. Thompson declined to serve. Deceased was the first ticket agent on the spur of the Lowell railroad which enters Woburn. His widow and two daughters survive him.

Writing of the death of Mr. Thompson recalls to mind the very conservative and careful way in which, as a rule, the gas companies of the Bay State are managed. For instance, the Woburn Company was organized in 1854, with a capital of $45,100, and that capital amount has not been altered since; although it is a fact that the business of the Company, taking note of only that which accrued from the natural increase of population in the town, would easily, under other methods of financiering and management, earn a fair dividend on $60,000 of capital. The gas consumers of Woburn, however, have been the gainers, in that they are permitted to share in the prosperity of the Company which thrives in their midst. It is perhaps needless to say that the late Mr. Thompson was a consistent advocate of the policy of protecting the Company's interests by means of dealing liberally with its patrons.

Mr. A. J. Carroll, who is well known in the West from his connection with the Steubenville (O.) Gas Light and Coke Company, resigned the Superintendency thereof on the 1st inst. It is his intention to retire permanently from business. He was a painstaking and faithful man.

We have to record the death of another prominent New England gas man, in the person of the Hon. Isaac Stebbins, whose demise occurred on June 21 at his residence on Franklin avenue, Chelsea, Mass. Deceased had acted as President of the Chelsea Gas Light Company from the time of the incorporation of the enterprise, which was effected in 1852. He was born in Stamford, Conn., on October 3, 1817, becoming a citizen of Chelsea in 1842. We hope to publish on another occasion an authenticated history of his life.

The Paterson (N. J.) Gas Light Company has elected the following officers: Prest. and Treas., John Reynolds; Sec., Robt. Schoonmaker; Directors, John Reynolds, E. B. King, H. A. Williams, J. Dunn, W. H. Williams, John S. Cooke, and J. H. Reynolds.

Mr. Norman G. Keenan now fills the position of Engineer to the Cincinnati Gas Light and Coke Company, vice Mr. John Fullager. A

rumor also reaches us to the effect that Capt. T. Kates, formerly Superintendent of the Company's East End station, has resigned his position.

CHICAGO (Ills.) advices, dated June 18, say that on this date, after a prolonged conference between the City Controller and representatives of the Gas Trust, a satisfactory settlement of the differences between the city and the Trust was arrived at. It was agreed that the city is to pay $1 per thousand cubic feet net for its gas during the current year, provided that the bills are promptly met at the expiration of each quarter. Our informant then adds that "promptly" in this case means within 30 days, which strikes us as being rather "slow" for the average Chicagoan. That length of discount time might be thought all right were San Francisco or Louisville, Ky, under consideration, in either of which places the "race is not always to the swift." It was agreed upon by the conferees that the $1 schedule will apply to the West Division of the city as well as to the North and South Divisions, where the price had already been practically adjusted. The Trust was represented in the conference by Messrs. Forstall, of the old Chicago Company, Judson, of the Consumers, and Billings, of the Peoples, assisted by F. S. Winston, Jr., as counsel. Now the question is, how long will this "agreement" last?"

ON the evening of June 17th the Borough Council of Merchantville, N. J., passed an ordinance granting Jesse W. Starr, Jr., the privilege of operating a gas works in that place. The permission provides that the gas distributed must be of not less than 22 candle power, and must be sold to consumers at a rate not in excess of $1.50 per thousand cubic feet. A contract is also entered into on the part of the Borough to take gas for its streets for a period of 10 years, at the expiration of which time the Borough reserves the right to purchase the plant in accordance with a specified plan of arbitration. Work is to be commenced within 30 days from the signing of the contract, and is to be finished within 60 days thereafter. Merchantville is in no immediate danger of being supplied with gas by the parties who have secured this contract. Perhaps Mr. Starr proposes to act in good faith in this instance; bnt between his former operations in Belvidere, N. J., and his present course at Macon, Ga., together with the fact that Mr. Van Steenbergh, of Goshen, N. Y., fame, to say nothing of the latter's celebrity in connection with certain gas enterprises in Texas, is connected with him, we are afraid that we will have to wait and see. In the meantime we might remark that Merchantville has a population of about 1,200 souls.

THE Cambridge (Ohio) gas works and franchises, which have been advertised for sale in our columns, have been leased to Mr. Murray McMillin, of Marietta, Ohio. The Marietta McMillin must have a good deal of faith in himself to assume the Cambridge responsibility; but as he is plentifully endowed with courage and ability, perhaps he will make a "go" of it. At any rate, he has our warmest wishes for success.

WERE one inclined to seriously listen to the blowhards of Toronto, Canada, it would be impossible to avoid the impression that the chief aim in life of the officials of the Toronto Gas Light Company was to supply about as poor a gas as possible. When the truth is told, however, it is seen that the Toronto blowers are on a par in their regard for veracity with others of their ilk in every known quarter of the globe. According to a statement just issued by Chief Johnstone, of the Canadian Inland Revenue, Department of Standards, it appears that only on one occasion during the fiscal year of 1886-7 was the Toronto Company's gas below the quality prescribed in the standard. On the occasion or day of the deficiency the thermometer had dropped only 34 degrees, between the hours of three and six P. M., the minimum figure standing exactly at zero. Gas men know thoroughly well what this means, especially when the drop occurs without hardly a moment's warning; or at a time when every weather indication seems to point to a rise instead of a tremendously rapid decline in temperature. Throughout the year, save on the day noted, the Toronto gas never came nearer standard candle power than two per cent. in excess; and on no occasion was the minimum standard, in respect of ammonical or sulphurous impurity content, reached. We might also note that the ultra-patriotic Canadians often charge the Toronto gas men with a lack of patriotism, in that the latter seem to prefer American gas coals to the Provincial article; but candor would then seem to compel the dissenters either to favor sulphurous gas or cease murmuring at a Company which prefers to supply pure gas at the expense of a trifling defection in its stock of theoretical patriotism.

ADVICES from Alexandria, Va., state that the local Committee on Light, which manage the city gas works at this place, have opened proposals for the rehabilitation of the plant. We understand that the estimates ranged all the way between $52,000 and $25,000. We hope, no matter who secures the contract, that work will be at once commenced. The experience of last winter ought to prove the necessity for immediate action.

THE Director of Philadelphia's Board of Public Works has ordered the Superintendents in charge of the several public lamp districts of the city to serve the following notice on houseowners whose shade trees interfere with the illumination of the roadways: "The trees upon your property obstruct the light from the public lamp, and you are hereby notified to remove the same under penalty provided by city ordinance." The ordinance under which Director Wagner took this step makes it an offense, punishable by a fine of $5, for any person to permit the branches or limbs of a tree to project in any manner so as to prevent any lamps from lighting the street in the immediate vicinity. The Director also directed a similar announcement against the owners of awnings or canvasses erected or stretched below the level of any lamp. These latter are by far the worst offenders, since their obstructive acts are likely to be felt in sections greatly frequented.

A NATURAL GAS COMPANY IN TROUBLE.—Advices from Bellaire, Ohio, are to the effect that the Bellaire natural gas company has been obliged to appear in Court as defendant in a suit brought by several of the local glass manufacturers. During the hearing the defendant swore that the initial pressure on the line had decreased 140 lbs., in spite of the fact that 11 new wells had been turned into the pipe line during the past year, and that they now have but 190 pounds pressure, instead of the 330 lbs. easily and regularly obtainable in June, 1887. The plaintiffs on the other hand, assert that the pressure was designedly lessened in order that they would be obliged to pay the defendant a larger sum of money. The case has attracted much attention, but its chief significance to our readers lies in the fact that, if the defendants did not perjure themselves, the prediction of Prof. Orton, in respect of the life of the natural gas flow in Ohio, is in keeping with many others which can be traced to the thoughtful and well-balanced mind of Ohio's noted scientist.

ON A TOUR OF INSPECTION.—Messrs. G. H. Davoll, Vice-President, J. K. Woodward, Jr., Secretary, and J. W. Dunbar, Supt., of the New Albany, Ind., Gas Light and Coke Company, have returned home from a tour of inspection—Vincennes and Indianapolis were among the points visited—made to examine the various improvements that might be incorporated in the plans for the construction of a model gas plant at New Albany.

RECOVERED DAMAGES.—An interesting case was considered last month in the Philadelphia Court of Common Pleas, No. IV., when argument was heard and the same taken under advisement. The case, which was that of Mrs. Virginia Geddes vs. the City of Philadelphia, was before the Court on exceptions taken by the city to the report of a referee, who had, as the result of an inquest previously taken, awarded Mrs. Geddes $8,000, of which 50 per cent. was for personal injuries to herself, and the balance for the loss of her husband, Jno. Geddes, both having suffered in this way. The couple were residing in a house, on the southeast corner of Lombard and 25th streets, which, on September 18, 1885, was more or less wrecked by an explosion of illuminating gas, the latter having entered the Geddes appartments through the house sewer or drain connection. The original escape made its way from the gas main into the adjoining sewerage conduits of the city. In consequence of the explosion—the gas was ignited in the Geddes' house through contact with an ordinary oil lamp that stood on a table close by the kitchen sink—John Geddes lost his life, while Mrs. Geddes lost the sight of one eye, in addition to which she sustained other painful and permanent injuries. The decision of the Court of review will probably be announced this week; but in any event it is likely to be appealed from.

THE Toledo (Ohio) Gas Light and Coke Company seemingly intends that Supt. Faben shall spend his summer vacation this year in increasing its main system. Very large additions are to be made thereto. In fact the work is well underway.

INFRINGEMENT SUIT.—About 10 days ago a bill of complaint was filed in the United States Circuit Court, Baltimore district, by Jas. F. Blair against W. W. Sinclair, President of the Incandescent Gas Light Company, of Baltimore, praying the Court to enjoin him from infringing upon a gas regulator patented by Llewellyn P. Blair, and made over by him to the complainant, and that the defendant be required to pay over the sum of $10,000 damages.

PUBLIC LIGHTING IN NEW YORK CITY.—Through the courtesy of Supt. McCormick, we are enabled to lay the following authentic figures, in respect of prices and number of public lights to be maintained in this city for current year, before our readers:

Name of Company.	Price per Lamp.	Number Lamps.
Consolidated	$17.50	15,863
Mutual	17.50	146
Equitable	12.00	1,531
Central	29.00	2,277
Northern	29.00	1,873
Yonkers	29.00	430
Globe (naphtha)	25.00	120
Average price	$22.71	22,240

The arc lighting figures and values are as follows:

Name of Company.	Price per Lamp per night.	Number Lamps.
Brush Electric Illuminating	.35	441
United States "	.35	352
East River Electric Light	.35	420
Ball Electrical Illuminating	.27½	48
Mt. Morris Electric Light	.17½	18
" " "	.23	44
" " "	.28	13
Harlem Lighting	.35	26
" "	.50	19
" "	.60	4
North New York Lighting	.29	7
" " "	.35	43
Average price	.34⅛	1,435

MEMORIAL TO THE LATE WM. HELME.—A noted American military authority once said that it was not a difficult matter to command men, but immediately admitted that the obedience which follows esteem constitutes the crowning glory of and instances best the superlative powers enjoyed by the commander who so secures the confidence of his subordinates. The late William Helme, then, was a commander in the highest sense of the term, for, to a man, those employed by him and his partner—Mr. John McIlhenny—in the operation of their Philadelphia enterprise, never questioned his fairness nor demurred at his authority. Such confidence between employers and the employed is, unhappily, of far too unfrequent existence; and perhaps to such diversity of feeling may be traced much of the labor trouble which beyond doubt is the greatest source of menace to the future development of the resources of our country. However, to show the complete and happy accord that existed between the late Mr. Helme and his employees, we submit the following reprint of the resolutions passed to the memory of Mr. Helme by those who served under him: "PHILADELPHIA, June 13, 1888.—*In Memoriam.*—We, the employees of Helme & McIlhenny, assembled this 13th day of June, 1888, to place upon this record our feelings of profound sorrow for the loss to us by death of our late employer, Wm. Helme. To know him was to respect and love him. Our daily intercourse during business hours has given opportunity for proving his sterling qualities, and we have ever found him gentle, conscientious and true. His fidelity to the interest and sympathy with the humblest of those in his employ commands our grateful recognition, and we shall ever cherish the memory of his association with us as employer and friend. Deeply impressed as we are by his death, we would wish also to extend by this our warmest sympathy to those upon whom this affliction must fall most heavily, and we feelingly and respectfully tender to them our sincere condolence, believing that the God in whom he trusted will be to them a strong consolation in this their time of trouble. *Resolved*, That these sentiments be published, and that a copy thereof be engrossed and presented to his family.

"JOHN W. PATTON, *Secretary.* THOMAS G. PYLE, *President.*

Committee.

" Ed. Maguire, T. Ferguson, Philip Indig, Jno. A. Barron.
" F. C. Viney, F. Schnatz, Jno. Anton, H. H. Pyle,
" P. Schaffer, J. Costello."

A LINE FROM SPOKANE FALLS, W. T.—The many friends of Mr. H. C. Thompson, who is pleasantly remembered from his former connection with the American Meter Company's branch at Cincinnati, Ohio, will be pleased to hear that he has nothing to regret in making the change from the Queen City to far-away, but bustling and busy Spokane Falls. The first annual meeting of the Spokane Falls Gas Light Company, with the fortunes of which he has been identified for something like a twelvemonth, was held last month, and the balance sheets that were then read go to show that those who own the gas plant have scant cause for regret over their proprietorship. The Spokane folks believe in gas; and, better still, they believe in the liberality and fairness of those now in command of the supply of the light of the present. When the ordinary routine business had been disposed of, the annual election for Trustees was proceeded with, the following gentlemen being named: Messrs. T. C. and W. H. Hopper, F. C. Griffiths, Thos. Reed and H. C. Thompson. The Trustees subsequently selected the following list of officers: President, T. C. Hopper; Vice-President and Treasurer, T. C. Griffiths; Secretary, Theo. Reed; Superintendent, H. C. Thompson. The Messrs. Hopper, who, it seems almost superfluous to add have always been identified with the American Meter Company, were present in person at the meeting.

HOW IS THIS FOR LOW!—The administration of the affairs of the East Saginaw (Mich.) Gas Light Company by Mr. G. A. Hyde, Jr., seems to indicate that his is a case of following in his father's footsteps, which, by the way, never yet led the man from Cleveland into danger. At any rate the Engineer of the East Saginaw Company informs us that the price of all gas used in that city for cooking, heating and power purposes has been fixed at the rate of $1.20 per thousand cubic feet. This is a tremendously low figure, when the circumstances of the case are duly weighed, and it ought to have a wonderfully stimulating effect on the business of the Company. The present (last week in June) protracted "hot spell" is keeping the gas stove makers on the jump to fill their orders; and we have it from good authority that the enterprising General Manager of the Maryland Metor and Manufacturing Company has not, within a fortnight, absolutely had time to attend to his private correspondence.

WE are indebted to Mr. King, of Jacksonville, Ills., for a copy of a map giving a bird's eye view of Secretary Littleton's thriving abiding place—the beautiful city of Quincy. When that Chicago reporter interviewed the solid Augustus last May on the subject of gas and gas meters, we believe the scribe intimated that his victim was a magnate, and the aforesaid reporter certainly seems to have spoken by the card, for the prime and uppermost feature in the map drawing before us shows a balloon majestically soaring above the solidly filled in squares of the city of Quincy, which bears the inscription, "Gus. Littleton." Long and high may he soar, even though the spirit of mortal should never be proud. As a means of showing the value and importance of the local gas works, the Quincy map may be said to be unique.

MESSRS. DAVIS AND FARNUM, of Waltham, Mass., are under contract to make important alterations in the plant of the Yarmouth (N. S.) Gas Light Company. Mr. Davis has devised a system of main extension for this point which has found great favor with the proprietors of the Company. The pipe however is to be imported fron Scotland.

The sage of Pawtucket entertained the Guild of Gas Managers, on June 20th, in that inimitable style so well known to the wayfaring gas man who ever has had occasion to visit the Stiness bailiwick. The visitors, and the delegation was a numerous one, first inspected the Pawtucket Company's Central Falls station, and then looked in on the station below the steamboat landing. The electric light annex was also examined, and we are sorry that we are obliged to keep mum in respect of some of the testimony there and then given. The visit was brought to a close by an attack on certain elaborate dinner preparations, served up under the direction of caterer Dispeau. The Pawtucket descent was voted a complete success.

WRITING of the above reminds us of the fact that the June meeting of the Society of Gas Lighting, which was held in New Haven, Conn., was a most enjoyable occasion. Mr. Sherman has completely recovered his old-time health and spirits, and, quite like Mr. Stiness, is a wonderfully clever and hospitable entertainer. East Rock has lost none of its charming quaintness as a spot whereon to live by the way—that is, on a rare day in June.

THE large triple-lift telescopic gasholder, with its great steel tank, intended for the relief of the Fourteenth street station of the Consolidated Gas Light Company, will be in working order next Fall. The Continental Iron Works, whose proprietors are the contractors for this undertaking, have now been engaged on the task for over a twelvemonth. The capacity of the vessel is rated at 3,300,000 cubic feet.

AFTER all, the mad pranks of the Chippewa river, when, something like four years ago, it caused great damage to the plant of the Eau Claire Gas Company, eventually proved a boon instead of a loss. The Company now boasts of a perfectly equipped coal gas plant, which

stands for an actual investment of $45,000. The mileage of mains totals up at 15, and the annual send-out is not short of seven millions cubic feet. This, too, in face of the fact that the public lighting is all of the electrical sort. The Company's officers are: President, M. Griffin; Vice President, D. R. Moon; Secretary, D. Drummond.

MR. O. D. M. Baker has been appointed referee to take and decide upon evidence in a suit for the discontinuance and dissolution of the Citizens Gas Light Company, of Poughkeepsie, N. Y. The referee's first sitting will be held on the 17th inst. This action has no significance other than that springing from a desire on the part of its present owners to effect a complete merger with the interests of the old Poughkeepsie Gas Company. President Atwater does not like to leave loopholes open.

THE American Meter Company's draughtsmen are not greatly in need of occupation just now, and the factory hands cannot be said to be without occupation either. Some of the Company's latest station meter contracts are appended: A 10-ft. 6-in. for Bridgeport, Conn.; a 9-ft. for Cleveland, Ohio; another of same size for St. Joseph, Mo.; a 7-ft. for Seattle, Washington Ter.; and a 4-ft. for Yarmouth, N. S.

THE St. Joseph (Mo.) Gas and Manufacturing Company has recently made an important concession in gas rates, the precise statement of which we are unable to make at present. The proprietors of the Company, however, seem to be preparing for a round increase in their business, judging from the size of the new station meter they have just ordered.

THE Camden (N.J.) Gas Company is overhauling and extending its main system. The expense of the work will not vary much from $18,000.

IN 1866 gas sold in Washington, D. C., for $3.80 per 1,000 cubic feet—and even Senator Spooner might admit then that it was cheap at that figure. Now, however, that sapient backwoodsman claims that the present $1.25 rate is far too high. What ——s these mortals be!

MISS COWDERY, of Milwaukee, Wis., was a month old last Thursday. May her shadow never grow less. Let's see; E. G. C. was a bachelor when the tin wedding of the Western Association was celebrated. Good enough!

ANNUAL MEETING, NEWARK, N. J.—At the annual meeting of the Newark Gas Light Company the following Directors were chosen: Messrs. Eugene Vanderpool, Ira M. Harrison, Theodore Runyon, E. H. Wright, J. R. Emery, M. I. Ward, R. F. Ballantine, Franklin Murphy and Horace N. Congar. There is solidity and ability.

ANNUAL ELECTION, BUTTE, MONTANA.—At the annual election of the Butte Gas Light and Coke Company the following executive management was chosen: President, J. B. Cleveland; Vice-President, W. R. Kenyon; Sec. and Treas., A. J. Davis, Jr.; Supt. and Manager, L. F. Jenison. Directors, J. B. Cleveland, Jno. Noyes, W. R. Kenyon, A. H. Barret and W. H. Hopper. This Company gains ground steadily.

ARTICLES incorporating the Western Gas Improvement Company were recently filed with the County Clerk of San Francisco, Cal. The Directors are Messrs. J. B. Crockett, Geo. W. Prescott, Chas, H. Simpkins, H. T. Scott, Henry Wadsworth, Russell J. Wilson and H. W. Brown. The capital stock is $1,000,000, divided between the Directors and the National Gas Light and Fuel Company, Chicago, Ills.

JUDGMENT AWARDED THE GAS COMPANY.—An interesting suit (Newark, N. J., Gas Light Company vs. M. H. Murray) was decided about a fortnight ago. The plaintiff sought to recover the sum of $28.40, the amount of a bill for gas, the consumer of which, as to his financial responsibility, was guaranteed by defendant. Murray pleaded the rather ingenious but decidedly diaphanous defense that he had agreed to hold himself responsible for the safety of the meter, but not for the payment of the gas which had passed through it. The plaintiff's lawyer urged the reverse, holding that the larceny of a gas meter could be classed as a felony, whereas default in the payment of a gas bill could only be attacked by a civil process. The Court found for the Company.

MR. EMIL LENZ reports that he is making satisfactory progress in the matter of installing the Munich system of regenerator furnaces in the works of the Central and Northern Gas Light Companies, New York city, under the contracts recently awarded him.

THE Director of the Quebec Laval University having thought that some of his charges were too profuse in the use of gas in their rooms, quietly watched the suspected ones until the necessary evidence of their prodigality was secured. Bills for the excess were handed the offenders (23 in number), and the students refused to pay up. Persisting in their refusal, Laval University can now accommodate 23 applicants for admission.

THE Providence Gas Light Company is extending its main system through Webster and Laban streets.

THERE is every reason to say that the Beverly (Mass.) Gas Light Company has purchased, and will operate under the former franchises of, the Beverly Electric Light Company.

THE Brockton (Mass.) Gas Company has declared a dividend of $1.75 per share. The capital stock of this Company is $64,000 (640 shares), and it is assessed, for purposes of local taxation, at $68,300.

WE are pleased to say that Mr. E. H. Williams, who superintends the interests of the United Gas Improvement Company at Waterbury, Conn., is rapidly mending from the effects of the attack of pleurisy that recently prostrated him.

MR. G. WALTON GOSS, a pre-eminent and sincerely respected resident of Clinton, Mass., died at his home in that city on the 19th ult. Mr. Goss was born in Lancaster, Mass., on July 11, 1851, and at the age of 17 went to Clinton to reside. Bright and active, and equipped fully for commercial life, he speedily made his mark. In fact at the time of his all too early demise there was hardly a prominent enterprise in Clinton with which he was not identified. He was President of the Clinton Gas Light Company, which corporation will miss a skilful manager. Deceased also found time to take much interest in local politics, and had served Clinton in the capacity of town treasurer, tax collector, water commissioner and chief engineer of the fire department. He was also a prominent Mason. In addition to all this, at the time of his demise he was connected with the First National Bank of Clinton as teller and assistant cashier.

AT the annual meeting of the Ipswich (Mass.) Gas Company, the following officers were elected: President, Jos. Ross; Secretary and Treasurer, W. K. Bell. Directors, Jos. Ross, Theo. F. Cogswell, D. M. Tyler, W. G. Brown and Dr. Y. G. Hurd.

Correspondence

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

What Mr. King Did Say when Discussing Professor Mendenhall's Lecture.

JACKSONVILLE GAS LIGHT AND COKE CO.,
JACKSONVILLE, ILLS., June 24, 1888.

To the Editor AMERICAN GAS LIGHT JOURNAL:

The report of what I attempted to say, in the discussion of Prof. Mendenhall's Lecture on Photometric Standards, delivered at our recent meeting in Chicago (see JOURNAL, June 16th, p. 435), being so unsatisfactory, I have been tempted to ask a little space that I might correct and explain more fully my meaning.

In the first place, I said nothing about platinum. What I said was that, "Ever since the question of candle power and illumination had been under discussion, I had had an idea that the solution would come through the *spectrum*, and that I had attempted several times to get a gentleman, well versed in spectrum analysis, interested with me in the matter, as I did not feel competent to handle the subject myself."

In the use of the spectrum my thought was that, in the analysis of the various lights, we could choose that light which would show the best colors; viz., the colors most pleasant and healthful to the eye and useful in other respects.

In this way that part of "The Problem" might be solved which Prof. Mendenhall refers to when he says, "We must, first, determine what species of radiant energy is most desirable."

In attempting to solve the second proposition of "The Problem," as the Professor puts it, my idea was that, as hardly a day passes that we do not read of some improvements in the photographer's art—in fact that pictures are actually being taken by artificial light—that by projecting rays of light (under like conditions) on to a sensitized paper or chemical, the elements of time and distance being taken into consideration, a means of comparison might be made that would possibly answer more fully the requirements than the standards now in use. As I said at the time, these had only been thoughts with me; and I was pleased to find that men so well qualified had been *working* in the same direction.

Very truly yours, E. J. KING.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS

Editor—JOS. R. THOMAS, C.E.
Asst. Editor—T. J. CUNNINGHAM.
Manager—C. E. SANDERSON.

PUBLISHED ON THE 2ND AND 16TH OF EACH MONTH
At No. 42 Pine Street, New York.

This is a recognized official organ of—
LIGHT, HEAT, STEAM, WATER-SUPPLY, VENTILATION, SANITARY IMPROVEMENT AND GENERAL SCIENCE.

TERMS:
SUBSCRIPTION—Three Dollars per annum, in advance.

AGENTS
NEW YORK—AMERICAN NEWS Co. 39 and 41 Chambers St.
BOSTON—S. M. PETTENGILL & Co., 6 State Street.
PHILADELPHIA—PRATT & Co., Corner 9th and Arch Streets.
England—C. W. HASTINGS, 22 Buckingham St., London, W.C.
Germany—B. WESTERMANN & Co., of New York

MONDAY, JULY 2, 1888.

Odd Lots.

STILL another gap in the ranks has been caused through the death, on June 23d, of Mr. George Richardson, who for many years had acted as President of the Wilmington (Del.) Coal Gas Company.

He had been a patient sufferer for some two or three years from a complication of diseases, but he struggled on to the end with rare fortitude. Deceased was one of the original members of the American Gas Light Association, having been elected to the Society at the organization meeting held in this city, April 16, 1873. Although failing health impelled him to resign therefrom (we think in 1886) his interest in its welfare was still maintained. What a harvest death has recently made among the fraternity.

PRESIDENT J. H. WALSH, of the Lincoln (Neb.) Gas Company, having decided to put in a set of water gas apparatus this season, has contracted with the National Gas Light and Fuel Company for the erection of a Springer cupola, the capacity of which is to be equal to 200,000 cu. ft. per diem. We understand that provision has also been made for the placing of a similar cupola, which is to be erected in another season or so.

THE Rochester (N. Y.) Gas Company, on July 1st, reduced its selling rate to $1.60 per 1,000, and the Municipal Gas Company, same city, agreed at the same time to serve its customers at the gross rate of $1.80 per 1,000, or $1.60, net. The rate for gas used for domestic purposes remains as before—$1.

THE Philadelphia contract for a partial supply of gas to the city, under the plan perfected by the authorities, which had been previously outlined in our columns, was awarded on Tuesday last to the single bidder, who submitted many processes. Mayor Fitler selected the proposition known as the Hanlon-Ledley one, under the details of which the Philadelphia Gas Improvement Company agrees to put into the city's holders, at the 25th Ward works, a 22-candle gas for the sum of 37 cents per thousand cubic feet. To this must be added a royalty of 2½ cents per thousand on account of the patentees' rights. The manufacturing plant, which is to be erected at the expense of the contractors, but on ground owned by the city, may be purchased at any time by the city at an upset or maximum price of $275,000.

THE Mayor of Baltimore has vetoed the ordinance recently passed by the City Council requiring the local gas company to repave, within 60 days, streets torn up by it. The Mayor, in explaining his adverse action, rather humorously says Baltimore already possesses sufficient legislation on the subject, and quaintly closes his remarks by intimating that the resolution under consideration would secure to the Gas Company the right to delay 60 days in restoring the pavements disturbed by it.

The Safety of Compressed Gas for Lighting Railway Cars.

One often hears it said that a grave source of danger accompanies the use of compressed gas for the lighting of railway coaches, in that the gas is liable to explode should a collision happen, the force of which was sufficient to derange or demolish the lighting plant. That this objection is more fancied than real has been pretty well illustrated in three comparatively recent railroad accidents. In one of these (Philadelphia and Reading Railroad) an escape of compressed gas from a leaky hose simply burnt for a few moments without any explosion. Experience in Germany has been of a similar nature, and a recent collision near Birkenhead, England, between two trains lit with compressed gas, was unaccompanied by any explosion. At the time of the collision between the Hoylake and Mersey tunnel trains, the gas in the latter was alight. The gas cylinders of the smashed coaches were taken from the debris and tested to a pressure of 150 lb. per sq. in., and they were found to be entirely uninjured beyond a few severe dents. The gas fittings of the remaining portion of both trains had not suffered in the least through the collission, and, with the exception of those in the smashed cars, not a single lamp glass was broken in either train.

The Market for Gas Securities.

There is nothing of importance to say in connection with the city gas share market, which still remains in a decidedly lethargic condition. The action of the Fire Commissioners in refusing the Standard Company permission to transport and store large quantities of inflammable oils within certain limits of the city has not tended to strengthen values any, and it is likely that more stringent rules than those now in force, respecting the storage of oils in bulk—more particularly in the instance of naphtha—in this city, will soon be enacted. Consolidated gas exhibits no firmness, and to-day (June 29) it is freely offered at 72½, while transactions could undoubtedly be effected at a considerable concession from the asking price. There is no reason for the depression. The output of the Company is nothing short of enormous, and the day consumption increase is exceptionally gratifying. Equitable shows no change in values. Mutual is steadier. Brooklyn shares are stiffening up, with the single exception of Citizens, which we quote at 55 to 58. The cause of this is undoubtedly the cut made in the dividend rate to 4 per cent. per annum, the interim declaration being 2 per cent., which return is payable to-day. The last dividend was at the rate of 5 per cent. Baltimore Consolidated is weak and lower; we quote it at 44½ to 44¾. At these figures it looks cheap. Chicago Trusts are returned at 30 to 22. The out-of-town situation, as a rule, is quite encouraging to holders of gas shares.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks.
16 WALL ST. NEW YORK CITY.
JULY 2.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	71½	72½
Central	440,000	50	55	65
" Scrip	220,000	—	47	57
Equitable	4,000,000	100	105	111
" Bonds	1,000,000	—	113	115
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	115	118
Mutual	3,500,000	100	91	93
" Bonds	1,500,000	1000	101	103
Municipal, Bonds	750,000		—	—
Northern	125,000	50	30	—
" Scrip	108,000			
Yonkers		50	—	80
Richmond Co., S. I.	300,000	50	55	60
" Bonds	12,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	102	103½
Citizens	1,200,000	20	55	58
" S. F. Bonds	320,000	1000	—	103
Fulton Municipal	3,000,000	100	133	135
" Bonds	300,000		—	106
Peoples	1,000,000	10	70	72
" Bonds (5's)	368,000	—	97	—
" " (6's)	94,000	—	100	—
Metropolitan	1,000,000	100	80	82
Nassau	1,000,000	25	102	105
" Ctfs	700,000	1000	98	100
Williamsburgh	1,000,000	50	122	125
" Bonds	1,000,000	—	111	112
Out of Town Gas Companies.				
Boston (Mass.) Gas Co	2,500,000	500	200	—
Buffalo Mutual, N. Y.	750,000	100	90	95
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	208	215
" " Bonds.	45,000	—	—	—
Chicago Gas Trust	25,000,000	100	30	32
Cincinnati G. & C. Co.	6,000,000	100	179	180
Consumers Toronto	1,000,000	50	192	—
Central, S. F., Cal.			—	84
Capital, Sacramento, Cal.			58	—
Consolidated, Balt.	11,000,000	100	44½	44¾
" Bonds	6,400,000		107	107½
Hartford, Conn	750,000	25	—	138
Jersey City	750,000	20	165	170
Laclede, St. Louis, Mo.	2,000,000	100	118	122
Louisville, Ky	2,570,000	50	125	130
Little Falls, N. Y.	50,000	100	—	100
" Bonds	25,000	—	100	103
Montreal, Canada	2,000,000	100	210	214
Memphis (Tenn.) Gas	750,000	100	48	51
" Bonds.	240,000	100	103	—
New Haven, Conn		25	193	197
Oakland, Cal.			32½	33½

Advertisers Index.

GAS ENGINEERS. Page

Jos. R. Thomas, New York City ... 28
Wm. Henry White, New York City ... 22
Wm. Mooney, New York City ... 28
William Gardner, Pittsburgh, Pa. ... 28
Fred. Bredel, N. Y. City ... 27

PROCESSES.

National Gas Light and Fuel Co., Chicago, Ills. ... 22
American Gas Improvement Co., Pittsburgh, Pa ... 22
Bartlett, Hayward & Co., Baltimore, Md ... 19
Wm. Henry White, N. Y. City ... 22
United Gas Improvement Co., Phila., Pa ... 21
Henry Pratt & Co., Chicago, Ill ... 18

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd, New York City ... 31
T. F. Rowland, Greenpoint, L. I ... 31
Delly & Fowler, Phila., Pa ... 31
Kerr Murray Mfg. Co., Fort Wayne, Ind ... 30
Stacey Mfg. Co., Cincinnati, Ohio ... 31
Bartlett, Hayward & Co., Baltimore, Md ... 19
Morris, Tasker & Co., Limited, Phila., Pa ... 30
Davis & Farnum Mf'g. Co., Waltham, Mass ... 29
R. D. Wood & Co., Phila., Pa ... 30
Bouton Foundry Co., Chicago, Ills ... 31
Smith & Sayre Manufacturing Co., New York City ... 31
Fred. Bredel, N. Y. City ... 27
United Gas Improvement Co., Phila., Pa ... 21
Henry Pratt & Co., Chicago, Ill ... 18

GAS AND WATER PIPES.

Gloucester Iron Works, Phila., Pa ... 28
Mellert Foundry and Machine Co., Reading, Pa. (John Fox, Selling Agent, N. Y.) ... 28
Ohio Pipe Co., Columbus, Ohio ... 28
Pancoast & Rogers, New York City ... 28
M. J. Drummond, New York City ... 28
Wells Rustless Iron Co., New York City ... 28
R. D. Wood & Co., Phila., Pa ... 30

REGENERATIVE FURNACES.

Bartlett, Hayward & Co., Baltimore, Md ... 19
Fred. Bredel, New York City ... 27
Chicago Retort and Firebrick Co., Chicago, Ills ... 27
H. C. Hann, Baltimore, Md ... 17
Wm. Henry White, N. Y. City ... 22

RETORTS AND FIREBRICK.

J. H. Gautier & Co., Jersey City, N. J ... 26
B. Kreischer & Sons, New York City ... 26
Adam Weber, New York City ... 26
Laclede Fire Brick Works, St. Louis, Mo ... 26
Brooklyn Retort and Fire Brick Works, Brooklyn, N. Y. ... 26
Borgner & O'Brien, Phila., Pa ... 26
James Gardner, Jr., Pittsburgh, Pa ... 26
Henry Maurer & Son, New York city ... 26
Chicago Retort and Fire Brick Co., Chicago, Ills ... 27
Baltimore Retort and Fire Brick Co., Baltimore ... 26
Oakhill Gas Retort and Fire Brick Co., St. Louis, Mo ... 26
Evens & Howard, St. Louis, Mo ... 27
Emil Lenz, New York City ... 27

SCRUBBERS AND CONDENSERS.

G. Shepard Page, New York City ... 20
R. D. Wood & Co., Phila., Pa ... 30

GAS GOVERNORS.

T. C. Hopper, Phila., Pa ... 24
Connelly & Co., New York City ... 23
R. K. Huntoon, Franklin, Mass ... 17

TAR AND CARBONIC ACID EXTRACTOR.

Geo. Shepard Page, N. Y. City ... 20

CEMENTS.

C. L. Gerould & Co., Brooklyn, N. Y ... 26
H. W. Johns Manufacturing Co., N. Y. City ... 17

GAS ENRICHERS.

Standard Oil Co., Cleveland, Ohio ... 32

GAS METERS.

Harris, Griffin & Co., Phila., Pa ... 34
American Meter Co., New York and Philadelphia ... 35
The Goodwin Gas Stove and Meter Co., Philadelphia, Pa ... 35
Helme & McIlhenny, Phila., Pa ... 35
D. McDonald & Co. Albany, N. Y ... 35
Nathaniel Tufts, Boston, Mass ... 34
Maryland Meter and Manufacturing Co., Baltimore, Md ... 34

EXHAUSTERS.

P H. & F. M. Roots, Connersville, Ind ... 18
Smith & Sayre Manufacturing Co., New York City ... 31
Wilbraham Bros., Philadelphia, Pa ... 23
Connelly & Co., New York City ... 23

GAS COALS.

Penn Gas Coal Co., Phila., Pa ... 33
Perkins & Co., New York City ... 32
Newburgh Orrel Coal Co., Baltimore Md ... 33
Despard Coal Co., Baltimore, Md ... 33
Chesapeake and Ohio R.R. Coal Agency, N. Y. City ... 33
Westmoreland Coal Company, Phila., Pa ... 33
Monongahela & Peters Creek Gas Coal Co., Pittsburgh, Pa ... 33

CANNEL COALS.

Perkins & Co., New York City ... 32
J. & W. Wood, New York City ... 32

VALVES.

Ludlow Valve Manufacturing Co., Troy, N. Y ... 24
John McLean, New York City ... 24
Chapman Valve Manufacturing Co., Boston, Mass ... 24
R. D. Wood & Co., Phila., Pa ... 30

PURIFYING MATERIAL.

Connelly & Co., New York City ... 23

GAS ENGINES.

Schleicher, Schumm & Co. Phila., Pa ... 456
Clerk Gas Engine Co, Phila., Pa ... 24

ENGINES AND BOILERS.

Jarvis Engineering Co., Boston, Mass ... 23
Ball Engine Co., Erie, Pa ... 18

GAS LAMPS.

The Siemens-Lungren Co., Philadelphia, Pa ... 25
G. Shepard Page, New York City ... 24
Albo-Carbon Light Co., Newark, N. J ... 23
Standard Gas Lamp Co., Phila., Pa ... 18

PURIFIER SCREENS.

John Cabot, New York City ... 24
Geo. A. Mills, Baltimore, Md ... 24

GAS STOVES.

American Meter Co., New York and Philadelphia ... 25
The Goodwin Gas Stove and Meter Co., Phila. Pa ... 36
Dinsmore Manufacturing Co., Boston, Mass ... 18

STREET LAMPS.

J. G. Miner, Morrisania, New York City ... 441
Bartlett Street Lamp Mf'g Co., New York City ... 17

BURNERS.

C. A. Gefrorer, Phila., Pa ... 32
Matchless Lighting Co., N. Y. City ... 17

STEAM BLOWER FOR BURNING BREESE.

H. E. Parson, New York City ... 444

GASHOLDER TANKS.

W. C. Whyte, New York City ... 30

GASHOLDER PAINT.

H. W. Johns Manufacturing Co., N. Y. City ... 17

COKE CRUSHER.

C. M. Keller, Columbus, Ind ... 33

ELECTRICAL APPARATUS.

Waterhouse Electric & Manufg Co., Hartford, Conn ... 19
Wm. Henry White, N. Y. City ... 22

BOOKS, ETC.

Goodwin's Directory of Gas Light Companies ... 27
King's Treatise ... 28
Scientific Books ... 34
Management of Small Gas Works ... 28
Gas vs. Electricity ... 26
Practical Electric Lighting ... 36
Electric Light Primer ... 23

HUNTOON'S GOVERNOR

For Gas Exhausters,

AND THE

Flannery, Granger, Lowe, Springer and Hanlon

STEAM-JET EXHAUSTERS

For Oil Gas,

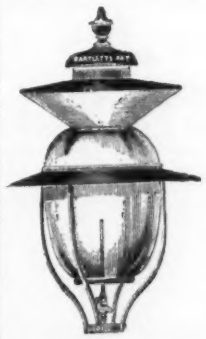
ARE MANUFACTURED AND SOLD BY

R. K. HUNTOON,

FRANKLIN, MASS.,

who guarantees that every instrument sent from his shops will give perfect satisfaction.

Bartlett Street Lamp Mfg. Co.



MANUFACTURERS OF

Globe Lamps,

FOR

Streets, Parks, Public Buildings, Railroad Stations, etc.

LAMP POSTS

A Specialty.

Office and Salesroom,

40 & 42 COLLEGE PLACE, - - N. Y. CITY.

Gas Companies and others intending to erect Lamps and Posts will do well to communicate with us.

"Matchless"

(Trade Mark Registered.)

Self-Lighting

GAS BURNER.

WITH GLASS LANTERN.

Pat. April 26, 1887. Awarded Prize Medal, Am. Inst., 1887. Send for Illustrated Circular of Testimonials, Price List, etc.

Matchless Lighting Co.
128, 130, 132 Reade St.,
New York.

H. W. JOHNS'

GASHOLDER PAINT,

Ready for Use.

For painting Holders and other Iron and Wood Work abou Gas Works.

RETORT CEMENT,

Ready for Use. For patching and coating iron and clay retorts pipes, connections, etc. In use and approved by the principal Gas Companies in the United States.

H. W. JOHNS MANUFACTURING COMPANY

Sole Manfrs. of **H. W. Johns' Asbestos Liquid Paints, Fireproof Roofing and Building Felts, Steam Packings, etc.,**

87 Maiden Lane, New York.

Hann's Hot Air Generator

FOR GAS RETORTS.

(Patented Nov. 28, 1882.)

Simple! Effective!

Suitable for any style of Gas Bench, from one to six retorts. No excavating. Built within the Bench.

Now in successful operation at the following Gas Works, viz.:

16 Benches 6's, Equitable Gas Light Company, N. Y. City.
20 " 6's, Equitable Gas Lt. and Fuel Co., Chicago, Ill.
36 " 6's, Chesapeake Gas Lt. Co., Baltimore, Md.
8 " 5's, Charleston Gas Lt. Co., Charleston, S. C.
1 " 3's, Palatka, Fla.
4 " 5's, Fitchburg, Mass.
2 " 5's, North Adams, Mass.
1 " 6's, Saco, Me.
1 " 5's, Georgetown, D. C.
2 " 3's, Cambridge, Md.

Address, for further particulars,

WALDO BROS., 88 Water St., Boston, Mass.
Balto. Retort & Fire Brick Co., Balto., Md.
And **H. C. HANN,** Patentee and Contractor for all kinds of Gas House Masonry, **607 S. Paca St., Balto., Md.**

WANTED,

POSITION AS SUPERINTENDENT of GAS WORKS

Must be a works sending out 10 million or more. The very best of references as to character and ability as a Gas Engineer. Is at present engaged as Supt. of a works. South or Southwest preferred. Salary an object. Address

693-eot-tf "MANAGER," care this Journal.

Position Wanted

As Superintendent or Foreman of a Gas Works,

By a strictly temperate man; one who is not afraid of hard work. Best of references furnished. Address

696-1 "K.," care this Journal.

BALL AUTOMATIC CUT OFF ENGINE
MADE ONLY BY
THE BALL ENGINE CO
ERIE PA.

No. 29 Champion.

PHILADELPHIA. NEW YORK. CHICAGO.
STEPHEN A. MORSE, President. EDWIN F. MORSE, Secretary.
GODFREY REBMANN, Vice-Pres. CARLTON M. WILLIAMS, Treas.

STANDARD GAS LAMP CO.,

Main Office, 411 Cherry St. Factory, 1101, 1103, 1105 Frankford Av.

PHILADELPHIA, PA.

It is to the interest of Gas Companies and Cities to double the efficiency of the light on streets by using Dyott's Patent "CHAMPION" LAMPS. They save 50 per cent. over others in cost of repairs, are ornamental, and indestructible except by violence.

Our Patent System of Instantaneously Lighting Gas (without electricity), for Railroad Depots is unequaled.

Dyott's High Candle Power Burner is a very superior lamp where a concentrated and brilliant light is wanted in Hotels, Stores, Depots, etc.

Special Drawings furnished and Estimates cheerfully given, either from Architects', Engineers', or our Draughtmen's Plans.

We manufacture every description of Plain and Ornamental Lamps, Posts, Brackets, Clusters, etc. Correspondence solicited.

CONE GAS STOVE

FOR COOKING. It will Broil, Bake, Roast, and do the entire cooking for a family of 12 persons. Warranted odorless, or the purchase money refunded. DINSMORE MFG. CO., No. 28 Kneeland Street, Boston, Mass. Send for Catalogue.

Plans and Estimates Furnished for New Works or for the Alteration of Old Works.

HENRY PRATT & CO.,

BUILDERS OF THE

PRATT & RYAN WATER GAS GENERATORS,

Arranged to Use Either Crude Oil or Naphtha.

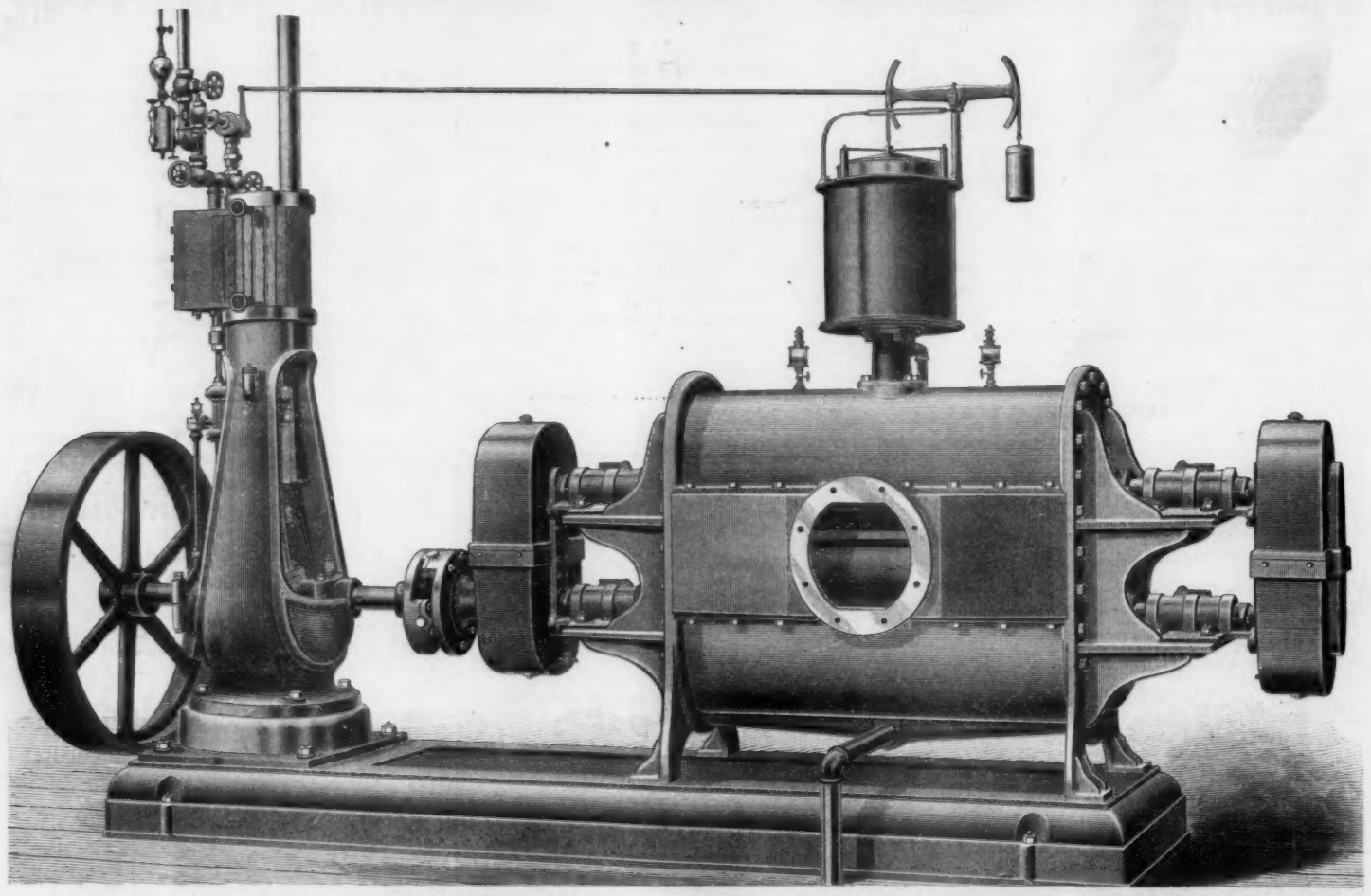
Condensers, Scrubbers, Purifiers, and all Apparatus for Coal or Water Gas.

IRON ROOFS, BOILERS, TANKS, ETC.

Orders and Correspondence Solicited.

Office and Works,
869 to 875
So. Halsted St.
CHICAGO, ILL.

ROOTS' NEW GAS EXHAUSTER.



P. H. & F. M. ROOTS, Patentees and Manufacturers, CONNERSVILLE, IND.

S. S. TOWNSEND, Gen. Agt., 22 Cortlandt St., N. Y. COOKE & CO., Selling Agts., 22 Cortlandt St., N. Y.

A Special Notice!

If you are looking for the Best Electric Lighting System in the World, Arc or Incandescent,

BUY THE WATERHOUSE.

A Gold Medal from Boston! A Modern System! Instantaneous Automatic Regulation! Saves Coal! Ahead of All Others!

THE WATERHOUSE ELECTRIC AND MFG. COMPANY,

Send for Catalogue. Hartford, Conn.

BARTLETT, HAYWARD & CO.

Baltimore, Md.

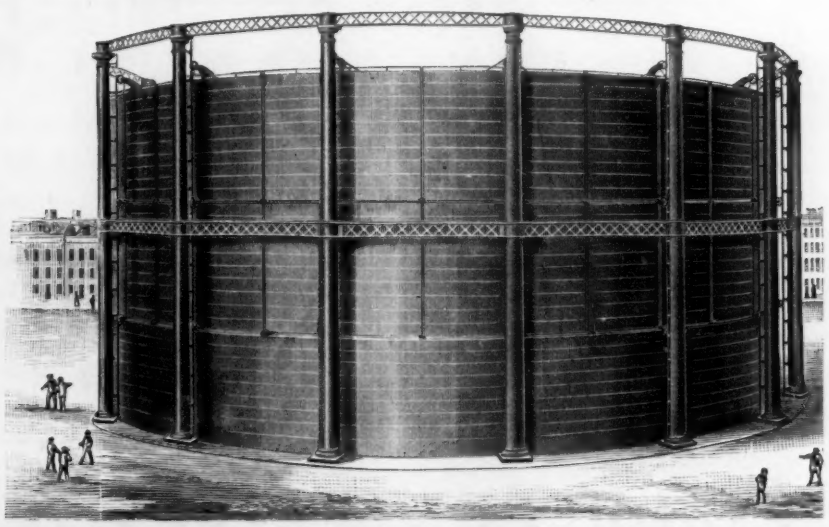
Triple, Double, & Single-Lift
GASHOLDERS.

Iron Holder Tanks.

ROOF FRAMES.

Cirders.

BEAMS.



PURIFIERS.

CONDENSERS.

Scrubbers.

BENCH CASTINGS.

OIL STORAGE TANKS.

Boilers.

The Wilkinson Water Gas Process.

THIRTY-CANDLE, NON-CONDENSABLE, FIXED GAS. THE MOST SUCCESSFUL GAS PROCESS IN OPERATION.

Munich Regenerative Furnace, System Drs. Schilling & Bunte.

HAZELTON BOILERS.

Gas Works Designed and Constructed.

To All Whom It May Concern!

The SIEMENS-LUNGREN COMPANY hereby warns the public against the use of various infringing Regenerative Gas Lamps which are offered for sale. This Company has heretofore delayed bringing suit to enjoin the manufacture or importation of such infringing lamps, solely because of the practical worthlessness of the infringing devices; and although, in each instance, they infringe some one or more of the various patents owned or controlled by this Company, they have fallen into disuse sooner than any suit could be brought to a hearing. As, however, the introduction of these infringing lamps has tended to discredit the practicability of our Company's system of regenerative gas lighting, we have instructed our Attorneys, Messrs. Geo. Harding, C. S. Whitman, and Silas W. Pettit, to give notice that legal proceedings will in future be taken against all such infringers.

THE SIEMENS-LUNGREN CO., 21st St. & Washington Av., Phila., Pa.

The Walker Tar and Carbonic Acid Extractor.

A very general demand exists, in both large and small Gas Works, for an apparatus that will be absolutely efficient in the removal of the tar which passes the hydraulic main and condenser. Many attempts have been made to accomplish this, but, I believe, without success, until the introduction, five years ago, in England, of the C. & W. Walker Patent Tar and Carbonic Acid Extractor. During these years this apparatus has been adopted by many of the most prominent Engineers, not only in England, but also on the Continent of Europe and in other parts of the world. It is only necessary to give here a partial list in order to convince any intelligent American Gas Engineer that this machine must have succeeded fully in accomplishing the desired results.

The following Engineers have personally given permission to refer to them:

G. C. Trewby, Esq., Engineer-in-Chief of the Gas Light and Coke Co., London. The manufacturing plant at Beckton is built in complete sections of 3,000,000 cubic feet capacity each. A Walker Tar Extractor has been fitted to each one of these sections. This was done after a long and thorough trial on one of its sections. The Tar Extractor has been supplied to other works of the Gas Light and Coke Co., including those of which John Methven, Engineer of the Gas Light and Coke Co. at the Nine Elms Station, is in charge.

Mr. Charles A. Gerdenier, Superintendent of the Bridgeport (Conn.) Gas Light Company, writes as follows, under date of Dec. 3, 1887:

"The C. & W. Walker Tar and Carbonic Acid Extractor has been in operation at these works for the past six weeks, and is an unqualified success. It removes every particle of Tar from the gas in once passing through the apparatus and a large percentage of the Carbonic Acid. I also feel quite sure that it prevents the formation and deposit of Naphthaline, because since I started the Washer I have had no stoppages from this cause. These works have been seriously troubled with Tar for many years, and I have used several kinds of apparatus and every expedient which has come to my attention for dealing with the difficulty, but without success. The Walker apparatus occupies comparatively small space, is less expensive than other systems, and requires but little attention. I carry 2½-inch seal, and have an automatic tar delivery valve. This Tar Extractor is indispensable to gas makers."

I have taken the Agency for the United States for this apparatus, and am now prepared to make contracts to erect it on the premises of any Gas Company.

This Tar Extractor will perform its work with about one-fourth the usual back-pressure heretofore required. It is simple in construction, and can be supplied at a very reasonable price—less than any other ever before introduced. Satisfactory results will be guaranteed in every instance.

GEO. SHEPARD PAGE, Sole Representative for the U. S., 69 WALL STREET, N. Y.

KIRKHAM, HULETT & CHANDLER, Limited,

London, S. W., England.

PATENT "STANDARD" WASHER-SCRUBBERS.

Following are extracts from letters received from some of the Gas Light Companies now using the "Standard" Washer-Scrubber:

OFFICE PITTSBURGH GAS CO., Sept. 1, 1887.

GEO. SHEPARD PAGE, ESQ.:

Dear Sir—Replying to yours, the "Standard" Washer-Scrubber at these works is giving good satisfaction, and by its use the income from our ammoniacal liquor has been increased 50 per cent. Yours respectfully,

JOHN H. McELROY, Engineer.

ALLEGHENY, PA., Sept. 24, 1887.

GEO. SHEPARD PAGE, ESQ.:

Dear Sir—By the use of the "Standard" Washer-Scrubber we have been able to increase the income from our ammoniacal liquor 33 per cent. The "Standard" is doing satisfactory work. Yours truly,

ROBT. YOUNG, Eng. and Supt.

OFFICE COLUMBUS GAS LT. AND COKE CO., COLUMBUS, OHIO, October 14, 1887.

GEORGE SHEPARD PAGE, ESQ.:

Dear Sir—By the use of the "Standard" Washer-Scrubber the ammonia is entirely removed from our gas. The apparatus gives good satisfaction.

Yours truly, E. McMILLIN, V. P. & Gen. Mangr.

GEORGETOWN, D. C., Sept. 27, 1887.

GEORGE SHEPARD PAGE, ESQ.:

Dear Sir—The "Standard" Washer-Scrubber, together with all the work of connecting the same with these works, has given entire satisfaction.

Truly yours, J. D. CATHELL, Supt.,

Georgetown Gas Lt. Co.

GEO. SHEPARD PAGE, 69 WALL STREET, NEW YORK,

Agent for the Western Hemisphere.

UNITED

GAS IMPROVEMENT CO.

No. 333 WALNUT STREET,

PHILADELPHIA.

OFFICERS:

GEORGE PHILLER, President.
W. W. GIBBS, Vice-President.
A. O. GRANGER, Gen'l Manager.
H. H. EDGERTON, Chemist and Engineer.
SAM'L T. BODINE, Sec'y and Treasurer.
EDWARD C. LEE, Ass't Sec'y and Treasurer.
ALEX. C. HUMPHREYS, Gen'l Supt.
JOS. H. COLLINS, JR., Ass't Gen'l Supt.
RANDAL MORGAN, Gen'l Counsel.

DIRECTORS:

GEORGE PHILLER,
WM. W. GIBBS,
THOMAS DOLAN,
JAMES A. WRIGHT,
HENRY C. GIBSON,
SAM'L T. BODINE,
S. A. CALDWELL,
WM. M. SINGERLY,
WM. T. CARTER.

BUILDERS, LESSEES AND PURCHASERS OF

GAS WORKS

Orders solicited from Large Cities, Small Towns, Mills, Institutions, from all who want More Light for Less Money.

PROCESSES. PROCESSES. ELECTRIC LIGHTING.

NATIONAL GAS LIGHT AND FUEL COMPANY,

No. 218 La Salle Street, Chicago.

THE SPRINGER SYSTEM

OF

Fuel and Illuminating Water Gas Works.

REFERENCES.

People's Gas Light and Coke Co.	Chicago, Ill.
Elgin National Watch Co.	Elgin, Ill.
C. R. I. & P. R. R. Shops	Chicago, Ill.
Decatur Gas Light and Coke Co.	Decatur, Ill.
Niles Gas Light Co.	Niles, Mich.
Newton Illuminating Co.	Newton, Kansas.
Wellington Light and Heat Co.	Wellington, Kansas.
Chippewa Falls Gas Light Co.	Chippewa Falls, Wis.
Elkhart Gas Light and Coke Co.	Elkhart, Ind.
Madison City Gas Light Co.	Madison, Wis.
South Bend Gas Light Co.	South Bend, Ind.
Sheboygan National Gas Co.	Sheboygan, Wis.
Salina Gas Light Co.	Salina, Kansas.
The Rathbun Co.	Deseronto, Prov. Ont.
Jefferson City Gas Light Co.	Jefferson City, Mo.
Mankato Gas Light Co.	Mankato, Minn.
Minneapolis Gas Light and Coke Co.	Minneapolis, Minn.
Lima Gas Light Co.	Lima, Ohio.
Bellevue Water and Fuel Gas Light Co.	Bellevue, Campbell County, Ky.
Bucyrus Gas Light and Fuel Co.	Bucyrus, Ohio.
Morris Gas Co.	Morris, Ill.
Los Angeles Gas Co.	Los Angeles, Cal.
San Diego Gas Fuel and Electric Lt. Co.	San Diego, Cal.
Jackson National Gas Co.	Jackson, Mich.
Sioux Falls Gas Co.	Sioux Falls, Dak.
Dakota Gas and Fuel Co.	Grand Forks, Dak.
St. Johns Mutual Gas Co.	St. Johns, Mich.
Stillwater Gas Light Co.	Stillwater, Minn.
St. Paul Gas Light Co.	St. Paul, Minn.
Emporia Electric and Gas Light Co.	Emporia, Kas.
Van Wert Gas Light Co.	Van Wert, Ohio.
*Lansing Gas Light Co.	Lansing, Mich.
*San Francisco Gas Light Co.	San Francisco, Cal.

* Building.

GUARANTEED ESTIMATES of Cost of Gas Furnished on Application.

WM. HENRY WHITE,

No. 32 Pine Street, - - - New York City.

ENGINEER AND CONTRACTOR FOR THE

Erection and Extension of Gas, Water, and Electric Light Works.

SOLE REPRESENTATIVE OF THE

McILHENNY REGENERATOR FURNACE PATENTS

And the Martin Water Gas Process.

Edison Incandescent and American Arc Electric Light Plants Installed.

Correspondence with Gas Companies contemplating extending or improving their Plants respectfully invited. Plans and Estimates Furnished.

Illuminating Gas from Natural Gas.

THE AMERICAN GAS IMPROVEMENT CO., Limited,

95 Fifth Avenue, Pittsburgh, Pa.

Erect Apparatus for the treatment of Natural Gas for an Illuminant under the

McKAY-CRITCHLOW SYSTEM.

Satisfaction in Economy and Quality Guaranteed.

Apparatus adapted to the manufacture of Water Gas, without any change whatever, should it be desirable to do so on account of Natural Gas playing out. Apparatus erected or Licenses sold at the following Works.

Pittsburgh Gas Works, J. H. McElroy, Engr.
Allegheny Gas Works, Robt. Young, Engr.
East End Gas Works, W. H. Denniston, Engr.
West Pittsburgh Gas Works, E. C. Critchlow, Supt.
Beaver Falls Gas Works, H. F. Dillon, Supt.
Titusville Gas Works, E. T. Roberts, Treas.
Salamanca, N. Y. Oil City, Pa.
Jamestown, N. Y., David Milne, Supt.
Meadville, Pa., Wm. Reynolds, Prest.
Warren, Pa., S. S. Franklin, Supt.
Franklin, Pa., C. W. Gilfillan, Prest.
Erie Gas Co., Erie, Pa., W. H. Hill, Engr.
Greensburg, Pa., Jas. C. Clarke, Prest.
Sewickley, Pa., James Forbes, Supt.
Bellaire, Ohio, John Ferguson, Supt.
New Castle, Pa., D. T. Flick, Supt.
Corry, Pa., C. H. Wetmore, Treas.
Sharon, Pa., S. Perkins, Prest.
Fort Scott, Kansas, L. K. Scofield, Owner.
Fostoria, Ohio, Jos. Gwynn, Supt.
Emporia, Kansas, Howard Dunlap, Treas.
Tiffin, Ohio, Hon. Geo. E. Seeny, Owner.
Wellsville, Ohio, Jas. H. Riggs, Prest.
Brownsville, Pa., J. W. Jefferies, Prest.
Connellsville, Pa., J. A. Armstrong, Sec. & Treas.
Tremont, Ohio, Fred. Fabing, Supt. & Treas.
Uniontown, Pa., W. L. Robinson, Lessee.

CONNELLY & CO., LTD.,

SOLE MANUFACTURERS OF THEIR PATENTED SPECIALTIES.

"IRON SPONGE." Saves money, saves labor, and is the most efficient purifying agent ever offered as a substitute for lime. Now used *in every State in the Union*, and purifying daily over *twenty-five million cubic feet.* Should be used in every gas works. Its own saving will pay for it many times over.

AUTOMATIC GOVERNOR. Has been on the market but *two years*, and in that time has been introduced *more generally* than any invention ever designed for use in gas works. Over *one hundred* of them now in use. Sensitive; reliable; perfectly automatic; reduces leakage; satisfies consumers, and gives great relief to the Manager. No gas works is *complete* without one of these machines.

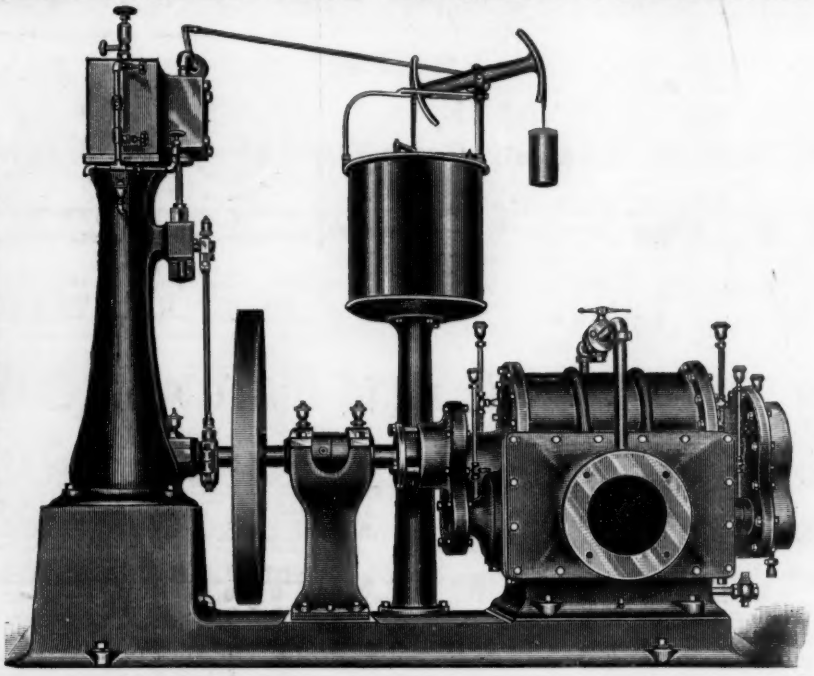
STEAM JET EXHAUSTER. Designed particularly for small works. Combines Exhaust Tube, Steam Governor, Gas Compensator, and Bye-Pass Valves in the most compact form possible; occupies but little space; uses very little steam; operated by ordinary workmen; saves formation of carbon in retorts; increases yield 10 to 15 per cent. Specially adapted for *mixing air* with oil gas. *No works* too small to use them profitably.

Prices given on all our specialties *delivered at any point in the United States.* Correspondence solicited.

CONNELLY & CO., LTD., No. 177 Broadway, New York City.

WILBRAHAM
GAS EXHAUSTER AND ENGINE COMBINED.

WILBRAHAM BROS., PHILADELPHIA, PA.



JARVIS ENGINEERING CO.,

61 Oliver St., Boston, Mass.

CONTRACTORS FOR ERECTING

COMPLETE STEAM OUTFITS FOR ELECTRIC LIGHTING STATIONS.

Steel Boilers set with Jarvis Pat. Boiler Setting

To burn **COKE SCREENINGS** for Fuel.

ARMINGTON & SIMS CO. ENGINES,

Belting direct to Dynamos, without using Shafting.

SEND FOR CIRCULARS.

REFERENCES.—Charlestown Gas & Electric Light Co., Charlestown, Mass.; Schenectady Gas & Electric Light Co., Schenectady N. Y.; Brookline Gas Co., Brookline, Mass.

Practical Electric Lighting,

By A. BROMLEY HOLMES, A.M.I.C.E.

With 87 Illustrations. Third Edition. **Price, $1.00.**

Electric Light Primer.

By CHARLES L. LEVEY.

A simple and comprehensive Digest of all the most important facts connected with the running of the Dynamo and Electric Lights, with Precautions for Safety, etc.

Price, 50 cents.

A. M. CALLENDER & CO., 42 Pine St., N.Y.

THE ALBO-CARBON LIGHT.

THIS SYSTEM HAS SHOWN ITSELF IN THOUSANDS OF CASES—**IN HALLS, CHURCHES, PICTURE GALLERIES, CONCERT HALLS, RESTAURANTS, BANKS, CLUBS, STORES, OFFICES, and PRIVATE RESIDENCES**—TO BE THE

Best Adapted and Most Successful Method of Gas Lighting Ever Offered.

The SOFTNESS AND PURITY OF THE LIGHT make it most desirable for Office and Household Uses. Its BRILLIANCY and POWER render it unrivaled for lighting Halls, Churches, etc. Its ECONOMY secures for it general favor wherever used.

NOTICE.—Suits are pending in the United States Circuit Court for the Northern District of Illinois and in the Supreme Court of the United States against various parties for infringement of our Letters Patent No. 247,925, dated October 4, 1881, and No. 333,862, dated January 5, 1886. All persons are cautioned against manufacturing, selling, or using any apparatus or material which infringes ou patents. We intend to prosecute all parties infringing patents owned by us.

ALBO-CARBON LIGHT CO. (Sole Manufacturers for the United States) **Main Office, Newark, N. J**

CHAPMAN VALVE MANUFACTURING CO.,

MANUFACTURERS OF

Valves and Gates for Gas, Ammonia, Water, Etc.

Also, Gate Fire Hydrants With and Without Independent Nozzle Valve. All Work Guaranteed.

WORKS & GEN'L OFFICE: Indian Orchard, Mass.

TREASURER'S OFFICE: 72 Kilby & 112 Milk Sts, Boston, Mass.

How to Reduce Leakage to Its Minimum.

USE

HOPPER'S AUTOMATIC DIFFERENTIAL GAS GOVERNOR.

Needs No Attention. Simple, Reliable, Perfectly Automatic.

"Nearly Thirty in Use."

BYE-PASSES, DRY CENTER VALVES, PRESSURE REGISTERS. Also, GOVERNORS FOR STREET MAINS, *NOT DIFFERENTIAL*, and for EXHAUSTERS, GAS ENGINES, etc.

Our new Bye-Pass is threefold in its action—passes gas through, or bye-passes, or shuts off entirely. Correspondence solicited; information given. Send for circulars and testimonials.

T. C. HOPPER & CO., - - No. 2227 Wood Street, Philadelphia, Pa.

GEO. SHEPARD PAGE,

No. 69 Wall Street, N. Y. City.

REPRESENTING

THE BOWER GAS LAMP.

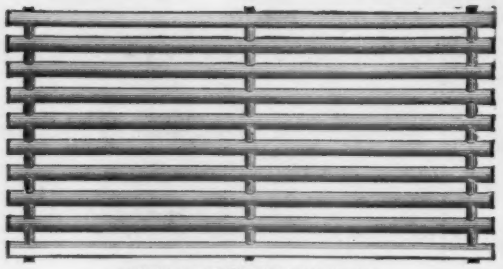
C. & W. Walker's Carbonic Acid & Tar Extracting Washer

B. DONKIN & CO.'S PAT. IMP. GAS VALVE.

Young & Beilby's Patents. Henry Aitkin's Patents.

R. P. SPICE, London, Eng. HENRY SIMON, Manchester, Eng.

MILLS' REVERSIBLE LIME TRAY,



AND

WOODWORK

Of Every Description

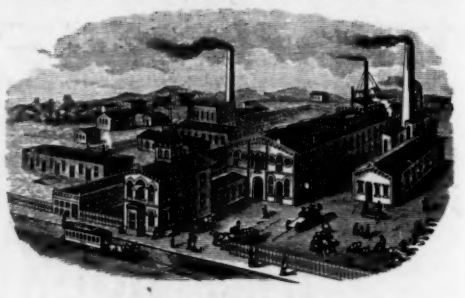
NEEDED BY GAS WORKS.

SEND FOR CIRCULAR AND PRICE LIST TO

GEORGE A. MILLS,

No. 20 East Barre St., Baltimore, Md.

LUDLOW VALVE MFG. CO.



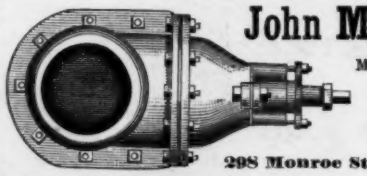
OFFICE AND WORKS,

938 to 954 River Street and 67 to 83 Vail Av

TROY, N. Y.

Hydraulic Main Dip Regulators, also Check Valves, Foot Valves, Yard-wash and Fire Hydrants. Send for Circulars.

Valves.—Double and Single Gate, ½ in. to 48 in., outside and inside Screws. Indicator, etc., for Gas, Water, Steam, and Oil. Send for Circulars.



John McLean

Man'facturer of

GAS VALVES.

298 Monroe Street, N. Y.

SPECIAL TRAYS FOR IRON SPONGE OR OXIDE OF IRON.

CHURCH'S TRAYS A SPECIALTY.

REVERSIBLE-STRONGEST-MOST DURABLE-MOST EASILY REPAIRED.

JOHN CABOT. TRAYS FOR GAS WORKS.

306-310 ELEVENTH AVENUE, NEW YORK.

WE ALSO MAKE THE CHEAPEST AND STRONGEST REVERSIBLE BOLTED TRAYS IN THE MARKET.

THE CLERK GAS ENGINE CO.,

Main Office, 1012, 1014, 1016, 1018 Filbert St., Philadelphia, Pa.

WM. W. GOODWIN, Prest. E. STEIN, Sec. S. LEWIS JONES, Asst. Sec. A. J. DOTY, Supt.

The utility and convenience of the Gas Engine being no longer an open question, it only remains now for intending purchasers to select the BEST. We claim for the CLERK GAS ENGINE that it is equal to any other manufactured as regards steadiness in running, simplicity, and ease of keeping in repair, and that it gives the greatest amount of power for the least money (both in first cost and expense of running) of any engine made. In support of this claim we refer to the test of the Gas Engines made under the direction of the American Institute of New York, in December, 1885, and heretofore published in these columns. These engines are especially adapted for continuous running under heavy loads, and we can refer to Engines which have run 22 hours a day for months at a time

Made in Sizes of 5, 10, 15, 20, and 25 Horse Power. All Engines Guaranteed for One Year.

GAS STOVES. GAS STOVES. GAS STOVES.

THE AMERICAN METER CO.,

MANUFACTURERS OF

GAS COOKING AND HEATING STOVES.

Gas Heating Stoves in all Sizes for Parlors, Chambers and Offices.

New Design Cast Iron "Economy" Cabinet Stoves, with Open or Closed Tops.

Gas Cooking Stoves and Ranges in all Sizes for Family and Hotel Use.

Catalogues and Price Lists on Application.

MANUFACTORIES,

508 to 514 West Twenty-second St., N. Y. Arch and Twenty-second St., Phila.

Nos. 244 & 246 North Wells Street, Chicago, Ill.

AGENCIES,

No. 177 Elm Street, Cincinnati, Ohio. No. 222 Sutter Street, San Francisco Cal.

No. 810 North Second Street, St. Louis, Mo.

GAS STOVE SHOW ROOMS, No. 223 Sixth Avenue, New York City.

RETORTS AND FIRE BRICK.

J. H. GAUTIER & CO.,

CORNER OF

GREENE AND ESSEX STREETS,

JERSEY CITY, N. J.

MANUFACTURERS OF

Clay Gas Retorts,

Gas House Tiles,

Fire Bricks, Etc. Etc.

Ground Clay, Fire Brick and Fire Sand in Barrels,

J. H. GAUTIER. C. E. GREGORY. C. E. GAUTIER.

BROOKLYN

Clay Retort & Fire Brick Works,

(EDWARD D. WHITE & CO.)

Manufacturers of Clay Retorts, Fire Brick, Gas House and other Tile.

VAN DYKE, ELIZABETH, RICHARDS & PARTITION STS.

Office, 88 Van Dyke St., Brooklyn, N. Y.

RETORTS AND FIRE BRICK.

LACLEDE FIRE BRICK MFG. CO.,

MANUFACTURERS OF

Fire Brick, Gas Retorts,

AND

ST. LOUIS STANDARD SEWER PIPE.

Blast Furnace and Cupola Linings, every description of Fire Clay Material, Fire Clay Flue Linings, Chimney Tops Dry Milled and Crude Fire Clays, etc.

OFFICE AND DEPOT

901, 903, and 905 Pine Street,

ST. LOUIS, MO.

ESTABLISHED IN 1845.

B. KREISCHER & SONS,

OFFICE FOOT OF HOUSTON ST., E.R., N.Y.

Gas Retorts,

TILES, FIRE BRICK.

AND EVERYTHING IN THE FIRE CLAY LINE.

RETORTS AND FIRE BRICK.

MANHATTAN

FIRE BRICK & ENAMELLED CLAY

RETORT WORKS.

ADAM WEBER.

CLAY GAS RETORTS

AND RETORT SETTINGS

FIRE BRICKS, TILES, ETC.,

Office and Works, 15th Street and Avenue C., N. Y.

Works,
LOCKPORT STATION, PA.

—ESTABLISHED 1864.—

JAMES GARDNER, JR.,

Successor to WILLIAM GARDNER & SON.

Office, Rooms 19 & 20, Lewis Block,
PITTSBURGH, PA, P. O. Box 373.

Fire Clay Goods for Gas Works.

CHAS. H. SPRAGUE & SON, No. 70 KILBY STREET, BOSTON, MASS., Agents for the New England States.

OFFICE, 418 to 422 East 23d St., New York.

ESTABLISHED 1856.

WORKS, PERTH AMBOY, NEW JERSEY.

HENRY MAURER & SON,

Excelsior Fire Brick & Clay Retort Works

CLAY GAS RETORTS, BENCH SETTINGS, FIRE BRICK, TILES, ETC.

GEROULD'S IMPROVED RETORT CEMENT.

A Cement for patching retorts, putting on mouthpieces, and making up all bench-work joints. This Cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick. For recommendations and price list address

C. L. GEROULD & CO.,

5 & 7 Skillman St., Brooklyn, N. Y.

Western Agent, H. T. GEROULD, Mendota, Ill.

GAS vs. ELECTRIC LIGHT.

We would invite attention to the able and exhaustive argument of General A. Hickenlooper, President of the Cincinnati Gas Light and Coke Company, contained in a handsome pamphlet of 96 pages, entitled

"EDISON'S INCANDESCENT ELECTRIC LIGHTS FOR STREET ILLUMINATION. REPORT OF AN ARGUMENT DELIVERED BY A. HICKENLOOPER BEFORE THE COMMITTEE ON LIGHT, MUNICIPAL COUNCIL, CITY OF CINCINNATI, JULY 22, 1886."

This is a subject of special interest to all Gas Light Companies.

Prices.

25 copies.....	$7.50	100 copies.....	$22.50
50 copies.....	12.50	250 copies.....	50.00

A sample copy will be sent by mail on receipt of 50 cts.

A. M. CALLENDER, & CO., 42 PINE ST., N. Y. CITY.

OAKHILL

GAS RETORT & FIRE BRICK

Works.

Proprietors,

PARKER-RUSSELL MINING & MFG. CO.

City Office, 711 Pine Street,

ST. LOUIS, MO.

Our immense establishment is now employed almost entirely in the manufacture of

MATERIALS FOR GAS COMPANIES.

We have studied and perfected three important points. Our retorts are made to stand changes of temperature, the strongest heats of the furnace, and the abrasion of feeding and emptying. Our customers are in almost every State of the Union, to all of whom we refer.

THOS. SMITH, Prest. AUGUST LAMBLA, Vice-Prest. & Sup

BALTIMORE

RETORT & FIRE BRICK CO.

MANUFACTORY AT

LOCUST POINT, BALTIMORE, MD.

Connection with the City by Telephone.

Clay Retorts, Blocks & Tiles,

FIRE BRICK, FIRE CLAY,

AND FIRE CEMENT.

Red and Buff Ornamental Tiles and Chimney Tops. Drain and Sewer Pipe (from 2 to 30 inches). Baker Oven Tiles 12x12x2 and 10x10x2.

WALDO BROS., 88 WATER ST., BOSTON, MASS

Sole Agents the New England States.

EVENS & HOWARD,

916 Market St., St. Louis. Mo.

Works, Howard Station, Mo. Pacific R.R.

Fire Brick, Gas Retorts

AND

RETORT SETTINGS.

Sewer Pipe, 3 to 24 in. diameter.

Glass Pot Clay, Ground Fire Clay, in barrels and in bulk. All kinds of Fire Clay Goods.

EMIL LENZ,

2 & 4 Stone St., N. Y. City.

CLAY GAS RETORTS

(ENAMELED.)

Fire Brick, Blocks & Tiles.

FIRE CEMENT, RETORT ENAMEL, RETORT CEMENT, ETC., ETC.

Regenerative and Half-Regenerative Benches.

PORTLAND CEMENT.

Correspondence Respectfully Solicited.

GREENOUGH'S "DIGEST OF GAS LAW."

Price, $5.00.

This is a valuable and important work, a copy of which should be in the possession of every gas company in the country, whether large or small. As a book of reference it will be found invaluable. It is the only work of the kind which has ever been published in this country, and is most complete. Handsomely bound. Orders may be sent to

A. M. CALLENDER & CO.,

42 Pine Street, N. Y.

FRED. BREDEL,

CONTRACTOR FOR THE COMPLETE

Erection and Equipment of Gas Works.

SOLE PROPRIETOR OF THE

KLOENNE PATENTS

FOR NORTH AMERICA.

REGENERATIVE FURNACES.

(900 Retorts are now fired in America by the Kloenne-Bredel System.)

SELF-SEALING MOUTHPIECES.

(Over 800 Now in Use.)

Standard Condensers. Washer-Scrubbers.

TAR WASHERS FOR WATER GAS PLANTS.

(In use in the works of the Chicago Gas Lt. Co.)

GASHOLDERS.

Bredel's Automatic Gas Governor.

Refers, by permission, to Mr. Eugene Vanderpool, Newark, N. J.; Mr. E. G. Cowdery, Milwaukee, Wis.; and Mr. Theo. Forstall, Chicago, Ills. For further infomation, address

FRED. BREDEL,

No. 208 East Seventeenth Street, N. Y. City.

CHICAGO RETORT AND FIRE BRICK COMPANY,

GEO. C. HICKS, President. 45th, Clark and La Salle Streets, Chicago, Ill. CHAS. A. REED, Sec. & Treas.

Manufacturers of Standard Clay Retorts, Gas Works Tiles and Settings, Fire Bricks, Ground Fire Clay, Fire Mortar, Blocks for Locomotives, Cupolas, Boilers, Ovens, etc.

The Hicks Regenerative Furnace.

FOR LARGE OR SMALL GAS WORKS. NO ROASTING PITHOLE FOR THE STOKERS. NO EXCAVATION BELOW THE ORDINARY ASHPAN.

This Bench is applicable everywhere as a practical adaptation of the Regenerative and Recuperative System, giving, at a moderate cost, a very high efficiency, with great saving of labor and coke. Even with an isolated bench we guarantee a production of 42,000 ft. per bench of 6's, 14″×26″×9′, on 30 per cent. of coke, *hot* or *cold*, with probable production of 48,000 ft. if desired. We also construct the highly successful *Two-Story Regenerative Benches* on the plans of Mr. A. Arndt, Engineer of the Chicago Gas Light and Coke Co. Also, the *Sloping Retort System* of Henry Pratt, Engineer of the Peoples Gas Light and Coke Company, of Chicago.

Fire Clay Materials for Water Gas Cupolas, etc. Special Attention to Making Tiles and Blocks to Order.

Boston Agents, - - FISKE, COLEMAN & CO.

GOODWIN'S DIRECTORY

OF THE GAS LIGHT COMPANIES of the UNITED STATES & CANADA.

Price, - - - - - - - $8.00.

Orders may be sent to

A. M. CALLENDER & CO., No. 42 Pine Street, N. Y. City.

GAS AND WATER PIPES. GAS AND WATER PIPES. ENGINEERS.

SAM'L R. SHIPLEY, Pres.
HENRY B. CHEW, Treas.

JAS. P. MICHELLON, Sec.
WM. SEXTON, Supt.

GLOUCESTER IRON WORKS,

GLOUCESTER CITY, N. J.

Cast Iron Gas & Water Pipes, Stop Valves, Fire Hydrants, Gasholders. &c.

Office No. 6 North Seventh Street, Philadelphia.

Pancoast & Rogers.

WROUGHT IRON PIPE,

VALVES AND GATES,

Cast Iron Gas & Water Pipe.

28 Platt and 15 Gold St., New York.

Water & Gas Pipe.

RUSTLESS Send for New Catalogue. RUSTLESS

The WELLS RUSTLESS IRON COMPANY,

No. 21 Cliff Street, New York City.

King's Treatise on Coal Gas.

A standard text-book for the Engineers and Managers of Gas Works, and for all who are concerned or take an interest in the manufacture and distribution of Coal Gas, and in the utilization of the Secondary Products resulting thereform; treating also of the Gas Engine, and of Gas Cooking and Heating Appliances.

In 3 Vols. Price per Vol., $10. Sold either by Volume or in Sets.

A M. CALLLENDER & CO., 42 Pine St., N. Y.

The Management of Small Gas Works.

By C. J. R. HUMPHREYS. Price, $1.

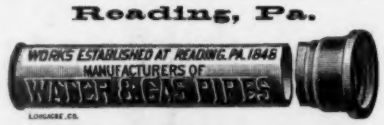
A running commentary on the different sections of gas management with reference to small undertakings, with some notes on the erection of the necessary plant.

A. M. CALLENDER & CO., 42 Pine St.. N. Y.

P. D. WANNER, Chairman. A. H. MELLERT, Sec. & Treas.

MELLERT FOUNDRY & MACHINE CO., Ltd.

Reading, Pa.



Specials—Flange Pipe, Valves and Hydrants, Lamp Posts, Retorts, etc.

General Foundry and Machine Work.

JOHN FOX, Selling Agent. **160 Broadway, N.Y.**

THE OHIO PIPE COMPANY,

MANUFACTURERS OF

Cast Iron Gas & Water Pipe,

BRANCH AND SPECIAL CASTINGS.

Gas-House Bench Castings, Hydraulics, Lamp Posts, Flange Pipe and Specials, Architectural Castings, Building Columns, Joists, Cellar Grates, Sash Weights, etc.

GENERAL FOUNDERS AND MACHINISTS.

Columbus, Ohio.

M. J. DRUMMOND,

SPECIAL CASTINGS AND LAMP POSTS.

Sales Agent for the New Phila. Pipe Works Co.

Office, Equitable Building, 120 Broadway, N. Y.

JOS. R. THOMAS, C.E.,

May be Consulted on all Matters Relating to Gas Works and Gas Manufacture.

ADDRESS THIS OFFICE.

WM. MOONEY

(Successor to WM. FARMER)

No. 94 Liberty St., N Y. City.

CONTRACTOR FOR THE ERECTION OF GAS WORKS, OR APPARATUS OF ANY CAPACITY. AGENT FOR WM. FARMER'S PATENTS.

Plans and Specifications Furnished.

WM. GARDNER,

Gas Engineer,

Lewis Block, Room 20, Pittsburgh, Pa.

Those who intend to make alterations in existing gas plants, or who contemplate the erection of new works, will find it to their interest to open correspondence with the above. Plans made and estimates furnished.

GAS LAMPS. EXHAUSTERS.

GAS LIGHTING BY GAS COMPANIES.

Gas Companies contemplating the purchase of electric lighting plants, will do well to investigate the results that can be accomplished by a general introduction of the Lungren Regenerative Gas Lamp. In a number of instances Gas Companies have purchased these lamps and rented them to their consumers at a low rate, this plan proving satisfactory to the consumer, and profitable to the Gas Company. It requires but a small expenditure to establish a lighting system with the Lungren Lamp, which in its results will compare favorably with any system of electric lighting, both as to economy and effect. Numerous consumers have also been obtained by Gas Companies introducing these lamps, from among those using kerosene oil. Write us for particulars.

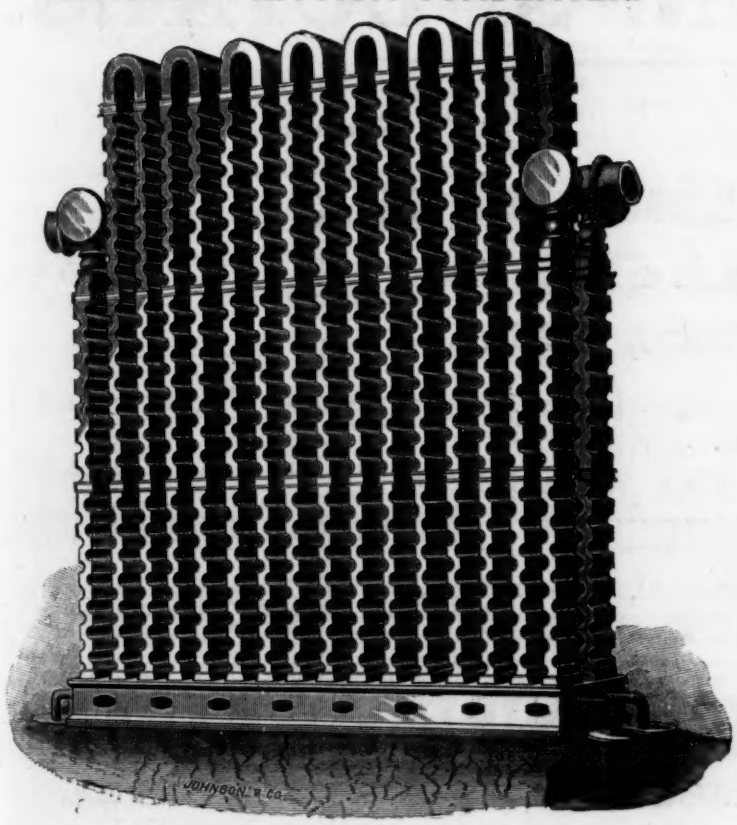
THE SIEMENS-LUNGREN COMPANY,

N. E. Cor. 21st Street and Washington Avenue, Phila., Pa.

F. J. DAVIS & J. R. FARNUM,

TRUSTEES AND AGENTS FOR THE

SINUOUS FRICTION CONDENSER.



We desire to draw the attention of the gas community to the merits of the SINUOUS FRICTION CONDENSER. Companies intending to introduce new condensers into their works will do well to confer with us and examine plans and estimates before contracting for any other pattern The FRICTION CONDENSER is now in use at the gas works located in the following places:

Portland, Me.	Brookline, Mass.	Pawtucket, R. I.	Fredericton, N. B.
Newport, R. I.	Chelsea, Mass.	Jamaica Plain, Mass.	St. John, N. B.
Gloucester, Mass.	Woburn, Mass.	Attleboro, Mass.	Paterson, N. J.
Newton & Watertown, Mass.	Peoria, Ill.	Calais, Me.	Dover, N. H.
	Clinton, Mass.	Fall River, Mass.	Waltham, Mass,

Nassau Works, Brooklyn, N. Y.

DAVIS & FARNUM MFG. CO.

MANUFACTURERS OF

Gas and Water Pipes,

AND

GAS AND WATER MACHINERY

OF THE MOST APPROVED PATTERN.

Also, Gasholders and Iron Roofing.

Orders from Gas and Water Companies promptly attended to.

WALTHAM, MASS.

Office, Room 55, Mason Building, 70 Kilby Street, Boston.

WORKS: { MILLVILLE, N. J. / FLORENCE, " / CAMDEN, "

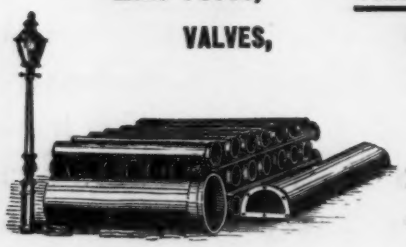
R. D. WOOD & CO.,

OFFICES: { 400 CHESTNUT ST., PHILADELPHIA.

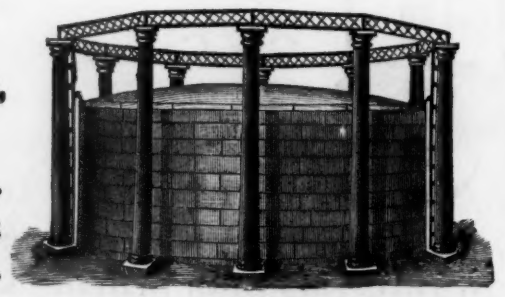
CAST-IRON PIPE 1½ to 72 Inches in Diameter.

Water Machinery and Gas Apparatus. **HEAVY CASTINGS.**

HOLDERS, PURIFIERS, FLOORS AND ROOFS,
LAMP POSTS, CONDENSERS, FLANGED PIPE,
VALVES, BENCH WORK, FIRE HYDRANTS,
METER CASES.



Estimates and Specifications for NEW WORKS or EXTENSIONS or ALTERATIONS of OLD ONES.



GASHOLDER TANK CONSTRUCTION, ETC.

Gas Companies and others about to erect Gasholders will find it profitable to consult W. C. WHYTE, who for over thirty years has made a specialty of

Holder Tank Excavation and Mason Work.

Fifty tanks now in operation show the sort of work done. Address

W. C. WHYTE, No. 15 Cortlandt St., N. Y. City.

MORRIS, TASKER & CO.,

Limited,

Builders of Gas Works,

PHILADELPHIA PA.

$38.00!

STREET MAIN SPECIALS.

We have in stock 200 tons of Street Special Castings, consisting of

Tees, Crosses, Elbows, Reducers,

Sleeves, Plugs, Line & Street Drips,

Etc., Etc., Etc.

Sizes, from 3 to 12 inches, to fit standard dimension pipe. Price, until further notice,

$38.00 per Net Ton of 2,000 pounds, F. O. B. Cars Fort Wayne.

SHIPMENTS MADE ON DATE OF RECEIPT OF ORDER.

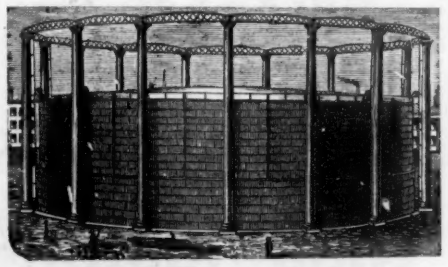
KERR MURRAY MANUFACTURING COMPANY,

A. D. CRESSLER, Gen'l Mangr. FORT WAYNE, IND.

GAS WORKS APPARATUS AND CONSTRUCTION. GAS WORKS APPARATUS AND CONSTRUCTION.

JAMES R. FLOYD,
(SUCCESSOR TO HERRING & FLOYD)
Oregon Iron Works,
531 to 543 West 20th St., N. Y.
Practical Builders of Gas Works,
MANUFACTURERS OF
ALL KINDS OF CASTINGS
AND
APPARATUS FOR GAS-WORKS.

BENCH CASTINGS
from benches of one to six Retorts each.
WASHERS: MULTITUBLAR AND AIR CONDENSERS; CONDENSERS; SCRUBBERS
(wet and dry), and
EXHAUSTERS
for relieving Retorts from pressure.
BENDS and BRANCHES
of all sizes and description.
FLOYD'S PATENT
MALLEABLE RETORT LID.
PATENT
SELF-SEALING RETORT LIDS.
FARMER'S
PATENT BYE-PASS DIP-PIPE.
SABBATON'S PATENT
FURNACE DOOR AND FRAME
BUTLER'S
COKE SCREENING SHOVELS.
GAS GOVERNORS,
and everything connected with well regulated Gas Works at low price, and in complete order.
SELLER'S CEMENT
for stopping leaks in Retorts.
N. B.—**STOP VALVES** from three to thirty inches at very low prices.
Plans, Specifications, and Estimates furnished.

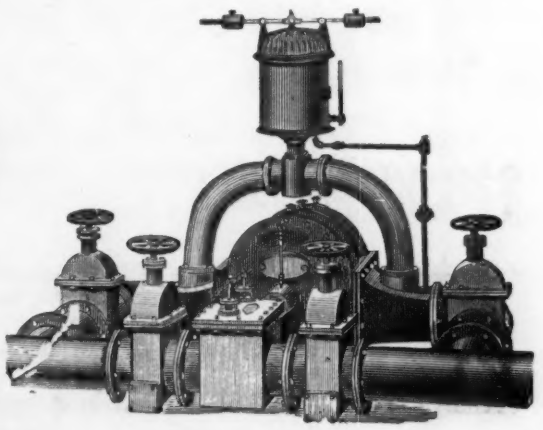
THE CONTINENTAL IRON WORKS.
THOS. F. ROWLAND, Prest. WARREN E. HILL and CHAS. H. CORBETT, V.-Prests. THOS. F. ROWLAND, JR., Sec. & Treas.

GAS HOLDERS OF ANY MAGNITUDE.
P. O. Station G., BROOKLYN, N. Y.
ENGINEERS AND MANUFACTURERS OF
Gas Holders
CONDENSERS, SCRUBBERS, VALVES,
PURIFIERS, SELF-SEALING RETORT LIDS,
Hydraulic Mains,
And all other articles connected with the manufacture and distribution of Gas.

H. RANSHAW, Prest. & Mangr. WM. STACEY, Vice-Prest. T. H. BIRCH, Asst. Mangr. R. J. TARVIN, Sec. & Treas.
STACEY MFG. CO.,
MANUFACTURERS OF
Single and Telescopic Gasholders,
IRON ROOFS, BRIDGES, LAMP POSTS,
Water and Oil Tanks, Coal Elevator Cars,
COKE CRUSHERS, BENCH CASTINGS,
And all kinds of Wrought and Cast Iron Work used in the erection of Coal and Oil Gas Works
Rolling Mill Machinery and Heavy Castings a Specialty.
Foundry: 33, 35, 37 & 39 Mill Street.
Wrought Iron Works: 16, 18, 20, 22, 24 & 26 Ramsey Street.
Cincinnati, Ohio.

Bouton Foundry Co.,
FOUNDERS AND MACHINISTS,
CHICAGO, ILL.
Gas Works Apparatus,
PURIFIERS, CONDENSERS,
Bench Work,
SPECIALS, LAMP POSTS,
SCRUBBERS,
Iron Roofs and Floors.
Plans and Estimates furnished for new works or extensions of old works.

1842. **DEILY & FOWLER,** 1888.
Laurel Iron Works.
Address, No. 39 Laurel Street, Philadelphia, Pa.
MANUFACTURERS OF
GASHOLDERS,
Single and Telescopic.
Holders Built 1882 to 1886, Inclusive:

Denver, Col.	Warren, Ohio.	Allegheny, Pa. (2d.)	York, Pa.	Salem, N. J. (3d)
Chicago, Ill. (West Side).	Bath, N. Y.	Atlanta, Ga. (2d.)	Chester, Pa.	Omaha, Neb. (2d)
Pittsburgh, Pa. (S. Side)	Lynn, Mass.	N.Y.City (Central Gas Co)	Hazleton, Pa. (2d.)	Lynn, Mass. (2d)
Pawtucket, R. I.	New Bedford, Mass.	Lynchburg, Va. (2d.)	Staten Island, N. Y.	Little Rock, Ark.
Brookline, Mass.	Waterbury, Conn.	Saylesville, R. I.	Saugerties, N. Y	Irvington, N. Y.
Sherbrooke, Can.	Deseronto, Can.	Rondout, N. Y.	Clinton, Mass. (Lan. Mills)	South Boston, Mass
Burlington, N. J. (2d.)	Hoosic Falls, N. Y. (2d.)	Atlantic City, N. J.	Chattanooga, Tenn.	Rye, N. Y. (2)
Bridgeton, N. J.	Bethlenem, Pa.	Augusta, Ga.	Galveston, Texas. (3d.)	Woodstock, Ont.
Bay City, Mich.	Atlanta, Ga. (1st.)	Waltham, Mass. (2)	Omaha, Neb.	Malden, Mass.
Erie, Pa.	Savannah, Ga.	Mahanov City, Pa.	Fort Plain, N. Y.	Staten Island, N. Y. (2d)
Jackson, Mich.	Montgomery, Ala.	New Castle, Pa.	Brunswick, Ga.	
Kalamazoo, Mich. (3d.)	Newport, R. I.	Long Island City, N. Y	Port Chester, N. Y.	
Glen Island, N. Y.	Portland, Oregon.	Macon, Ga.	New Rochelle, N. Y.	

SMITH & SAYRE MFG. COMPANY,
G. G. PORTER, Prest. *245 Broadway, N. Y.* CHAS. W. ISBELL, Sec'y.
Machinery & Apparatus for Gas Works
Drawings, Plans, and Estimates Furnished for the Improvement, Extension, or Alteration of Gas Works, or for the Construction of New Works.
Mackenzie's Patent Rotary and Steam Jet Gas Exhausters, Governors, Compensators, Condensers, Washers, Scrubbers. Isbell's Patent Automatic Street Pressure Governor, Gas and Water Valves, Hydraulic Main Dip Regulator, Bench Castings, etc. Purifying Boxes and "Standard" Scrubbers, Isbell's Patent Self-Sealing Retort Doors,


GAS COALS. CANNEL COALS. GAS ENRICHERS.

JAMES D. PERKINS. **PERKINS & CO.,** F. SEAVERNS.

General Sales Agents for

The Youghiogheny River Coal Company's

OCEAN MINE YOUGHIOGHENY GAS COAL.

The Coal from the Ocean Mine (recently operated by *Messrs. W. L. Scott & Co.*, of Erie, Pa.,) is now used by all the leading Gas Companies in the United States from Maine to Texas, and is recognized as *the only reliable Youghiogheny Gas Coal.* (See Map on p. 87 of this Journal, Feb. 16, '85.)

P. O Box 3695, New York **PERKINS & CO., 228 and 229 N. Y. Produce Exchange.** BEAVER STREET ENTRANCE.

BRECKENRIDGE CANNEL,

OF KENTUCKY.

This Colliery was re-opened in June, 1886, since which date the Cannel has been delivered to over sixty of the leading Gas Companies in this country and in Europe. As an enricher ONE TON of this Cannel will do the work of TWO TONS of any other available Cannel, and is more economical than Naptha or Oil of any character. It can be delivered in parcels of one car load or more to any point in the United States or Canada.

(See AMERICAN GAS LIGHT JOURNAL, June 16, '86, pp. 346–7.)

P. O. Box 3695, New York. **PERKINS & CO., 228 and 229 N. Y. Produce Exchange** BEAVER STREET ENTRANCE.

JELLICO GAS CANNEL,

FROM TENNESSEE.

This Colliery, operated by the Standard Coal and Coke Company, of Knoxville, Tenn., is now in full operation, and orders can be filled without delay. Situated directly on Railroad, shipments can be made to any point in the United States. The attention of Southern Gas Companies is called to the fact that this Cannel is the most accessible to them of any Cannel in the States. See Map in AMERICAN GAS LIGHT JOURNAL, Feb. 16, 1888.

P. O, BOX 3695, New York. **PERKINS & CO., 228 and 229 N. Y. Produce Exchange.** BEAVER STREET ENTRANCE.

JAMES & WILLIAM WOOD,

Gas and Cannel Coal Contractors,

No. 40 St. Enoch Sq., Glasgow. No. 2 Talbot Court, London.

Proprietors of the **BATHVILLE COLLIERIES** (which produce the celebrated **BOGHEAD CANNEL**), Shields, Shieldmuir, Drumpeller, and other Collieries. This Firm offer

STANDARD CANNELS,

Unequaled as Gas Enrichers.

Analyses, prices, and all further information furnished on application to

Agency for U. S., Room 93, Nos. 2 & 4 Stone St., N.Y. City.

The Standard Oil Company,

REFINERS OF

NAPTHA AND GASOLINES.

ALSO MANUFACTURERS OF

A Special Grade of Naptha for Gas Companies

FOR ENRICHING COAL GAS.

Correspondence solicited.

No. 43 Euclid Avenue, Cleveland, Ohio.

To Gas Companies.

We make to order **CAP BURNERS** to burn any amount under a stated pressure. Send for samples.

Also, SERVICE CLEANERS, DRIP PUMPS, and STREET MAIN PROVING APPARATUS.

C. A. GEFRORER,

248 N. 8th Street, Phila., Pa.

COKE CRUSHERS. GAS COALS. GAS COALS.

Newburgh Orrel Coal and Coke Co.

MINERS AND SHIPPERS OF

STEAM, SMITHING, AND GAS COALS,

Foundry and Crushed Coke.

Home Office, 33 S. Gay Street, Baltimore, Md.

CHAS. MACKALL, Gen. Mangr.

CHAS. W. HAYS, Agent, No. 1 Broadway, N. Y.

Shipping Wharves, Locust Point, Baltimore.

THE DESPARD COAL COMPANY

OFFER THEIR SUPERIOR

DESPARD COAL

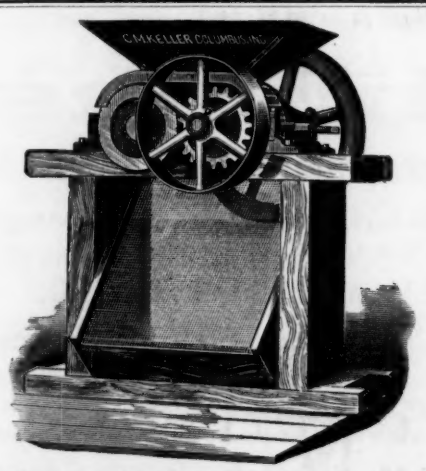
To Gas Light Companies and Manufacturers of Fire Clay Goods Throughout the Country.

ROUSSEL & HICKS, 71 Broadway, N. Y. } *AGENTS.* { BANGS & HORTON, 16 Kilby St., Boston.

Mines in Harrison Co., West Va. Wharves, Locust Point, Balt.

Company's Office, 15 German St., Baltimore, Md.

Among the consumers of Despard Coal we name: Manhattan Gas Light Co., N. Y.; Metropolitan Gas Light Co., N. Y.; Jersey City, (N. J.) Gas Light Co.; Washington (D. C.) Gas Light Co.; Portland (Maine) Gas Light Co. Reference to them is requested.

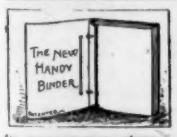


Keller's Adjustable Coke Crusher.

SIMPLE, STRONG, AND DURABLE.

C. M. Keller, Sec. & Supt. Gas Lt. & Coke Co. Columbus, Ind.

Correspondence Solicited.



THE NEW HANDY BINDER.

This article may be described as elegant in appearance, strong, durable, and possessing many special qualities of its own. It allows the opening of the pages perfectly flat, whether one or several numbers are in the binder Any number can be taken out and replaced without disturbing the others. The papers are not mutilated for subsequent binding in permanent form. The binder is supplied with gilt side title, and is an ornament to any desk or reading table. The JOURNAL, filed in the Handy Binder, becomes a volume of great value, always convenient for instant reference. **Handy Binder, Postage paid, $1 00.**

A. M. CALLENDER & CO., 42 Pine St., N. Y.

BOOKS.

DISTILLATION OF COAL TAR AND AMMONIACAL LIQUOR.

By GEORGE LUNGE. Price $12.50.

A TREATISE ON THE COMPARATIVE COMMERCIAL VALUES OF GAS COALS AND CANNELS.

By DAVID A. GRAHAM. 8vo., Cloth. Price $3.

Orders for these books may be sent to this office.

A. M. CALLENDER & CO.,

42 PINE ST., N. Y. CITY.

THE PENN GAS COAL CO.

OFFER THEIR

Coal, Carefully Screened & Prepared for Gas Purposes.

Their Property is located in the Youghiogheny Coal Basin, near Irwin and Penn Stations on the Pennsylvania Railroad, and on the Youghiogheny River.

Principal Office:

209 SOUTH THIRD STREET, PHILA., PA.

Points of Shipment:

Pennsylvania Railroad Piers; Greenwich Wharves, Delaware River; Pier No. 1 (Lower Side), South Amboy, N. J.

Chesapeake & Ohio Railway Coal Agency,

FOR THE SALE OF THE

Superior Kanawha Gas Coals, Cannelton Cannel,

Also, SPLINT AND STEAM COALS,

From the Kanawha and New River Regions, on the line of the Chesapeake & Ohio R'way.

C. B. ORCUTT, General Agent, - - No. 1 Broadway (Room 217) New York City.

FRANCIS H. JACKSON, Prest. EDMUND H. MCCULLOUGH, V.-Prest. CHAS. F. GODSHALL, Treas. H. C. ADAMS, Sec.

THE WESTMORELAND COAL CO.

Chartered 1854.

Mines situated on the Pennsylvania and the Baltimore and Ohio Railroads, in Westmoreland County, Penn.

POINTS OF SHIPMENT:

PHILADELPHIA, BALTIMORE, SOUTH AMBOY, N. J., WATKINS (SENECA LAKE), N. Y.

Since the commencement of operations by this Company its well-known Coal has been largely used by the Gas Companies of New England and the Middle States, and its character is established as having no superior in gas giving qualities, and in freedom from sulphur and other impurities.

Principal Office, 224 South 3d St., Phila., Pa.

A. M. SCOTT, PRESIDENT. A. DEMPSTER, C.E., SECRETARY. W. K. GILLESPIE, TREASURER.

MONONGAHELA AND PETERS CREEK GAS COAL CO.,

PRODUCERS OF

Coal Bluff Gas Coal.

MINES LOCATED ON THE MONONGAHELA DIVISION OF THE PENNSYLVANIA RR. IN THE CENTRAL PORTION OF THE PITTSBURGH COAL FIELD.

Points of Shipment—Buffalo, Cleveland, Erie, Chicago, New Orleans.

Since the introduction of Coal Bluff Gas Coal it has aken rank among the few first-class Gas Coals, and acknowledges no superior in gas-giving qualities, ease of working, quality of coke, and freedom from impurities.

General Office, 43 Sixth Ave., Pittsburgh, Pa.

GAS METERS. GAS METERS. GAS METERS.

INTERNATIONAL--1876--EXHIBITION.

The U. S. Centennial Commission

HAVE DECREED AN AWARD TO

HARRIS, GRIFFIN & CO.,

Twelfth and Brown Streets, Philadelphia, Pa. No. 49 Dey Street, N. Y. City, and No. 75 North Clinton Street, Chicago, Ill.

FOR THE FOLLOWING REASONS:

The Exhibit consists of a Series of METERS from the Largest Size Station Meters for the use of the MANUFACTURE OF GAS, to those for the use of the ORDINARY CONSUMER. The Instruments are WELL MADE, RELIABLE as to INDICATION, and embody a number of sundry improvements which, with the general character of the Exhibit, entitle the whole to commendation.

Attest—J. L. CAMPBELL, Secretary, pro-tem. Signed—A. T. GOSHORN, Director General. J. R. HAWLEY, President.

Dry Gas Meter.

With 29 years' experience and the best facilities for manufacturing, is enabled to furnish reliable work and answer orders promptly.

NATHANIEL TUFTS,

No. 153 Franklin Street, Boston, Mass.,

MANUFACTURER OF

DRY GAS METERS.

Station Meters of any Capacity.

Test and Experimental Meters, Pressure Registers, Pressure Gauges Pressure and Vacuum Gauges.

METER PROVERS, PHOTOMETERS, STREET LANTERNS, ETC., ETC.

Patent Cluster Lanterns for Street Illumination.

CHARLES E. DICKEY. JAMES B. SMALLWOOD. CHARLES H. DICKEY.

Maryland Meter and Manufacturing Co.,

307 and 309 Saratoga Street, Baltimore, Md. 195 and 197 Michigan Street, Chicago, Ill.
1115 Olive Street, St. Louis, Mo.

MANUFACTURERS OF

DRY GAS METERS, STATION METERS, GLAZED METERS, TEST METERS, METER PROVERS, PRESSURE & VACUUM REGISTERS

Governors, Indicators, Service and Meter Cocks, and Meter Connections.

Success Gas RANGE

"SUCCESS" GAS RANGES.

Success Gas RANGE

Meter Repairing a Specialty.

SCIENTIFIC BOOKS.

We are prepared to furnish to Gas Managers, and others interested in the topics treated of, the following books, at prices named:

KING'S TREATISE ON THE MANUFACTURE OF COAL GAS. Three vols.; $10 per vol.

GAS MANUFACTURE, by WILLIAM RICHARDS. 4to., with numerous Engravings and Plates, in Cloth binding. $12.

TECHNICAL GAS ANALYSIS. $2.80.

GAS MANAGER'S HANDBOOK, by THOS. NEWBIGGING. $4.80.

GAS CONSUMER'S GUIDE. $1.

A GUIDE TO GAS LIGHTING. 40 cents.

GAS MEASUREMENT AND GAS METER TESTING, by F. W. HARTLEY. $1.60

GAS CONSUMER'S HANDBOOK, by WILLIAM RICHARDS, C.E.; 18mo., Sewed. 20 cents.

A PRACTICAL TREATISE ON GAS AND VENTILATION with Special Relation to Illuminating, Heating, and Cooking by Gas, by E. E. PERKINS. $1.25.

PRACTICAL TREATISE ON HEAT, by THOMAS BOX. Second edition. $5.

GAS WORKS—THEIR ARRANGEMENT, CONSTRUCTION, PLANT, AND MACHINERY. $8.

COAL; ITS HISTORY AND USE, by PROF. THORPE. $3.50.

THE GAS WORKS OF LONDON, by COLBURN. 60 cents.

THE GAS FITTER'S GUIDE, Showing the Principles and Practice of Lighting with Coal Gas, by JOHN ELDREDGE. 40 cents.

GAS WORKS, AND MANUFACTURING COAL GAS, HUGHES. $2.20.

THE MANAGEMENT OF SMALL GAS WORKS, by C. J. R. BUMPHREYS. $1.

MANUAL FOR GAS ENGINEERING STUDENTS, by D. LEE, 40 cents.

HOW TO MANAGE GAS, by F. WILKINS. Paper. 20 cents.

THE GAS MANAGER IN THE LABORATORY, by a Practica Student. 8vo., Cloth. $1.50.

THE DOMESTIC USES OF COAL GAS, AS APPLIED TO LIGHTING, by W. SUGG. $1.40.

DISTILLATION OF COAL TAR AND AMMONIACAL LIQUOR by GEO. LUNGE. New Edition. $12.50.

A TREATISE ON THE COMPARATIVE COMMERCIAL VALUES OF GAS COALS AND CANNELS, by D. A. GRAHAM 8vo., Cloth. $3.

GAS COMPANIES DIRECTORY. $3.

GAS VERSUS ELECTRIC LIGHT. 50 cents.

PURIFICATION OF COAL GAS, by R. P. SPICE. 8vo. $3.

The above will be forwarded by express, upon receipt of price. We take especial pains in securing and forwarding any other Works that may be desired, upon receipt of order. All remittances should be made by check, draft, or post office money order.

A. M. CALLENDER & CO., No. 42 Pine Street, New York.

GAS METERS. GAS METERS. GAS METERS.

GEO. J. McGOURKEY, Pres. WM. H. McFADDEN, Vice-Pres. (Phila.). WM. N. MILSTED, Gen. Supt. & Treas. (New York). WM. H. DOWN Sec

AMERICAN METER COMPANY.

WET AND DRY GAS METERS. PRESSURE REGISTERS. METER PROVERS.
STATION METERS. PRESSURE & VACUUM REGISTERS. PORTABLE TEST METERS.
EXHAUSTER GOVERNORS. PRESSURE & VACUUM GAUGES. EXPERIMENTAL METERS.
DRY CENTRE VALVES. CRESSON GAS REGULATORS. AMMONIA TEST METERS.
GOVERNORS FOR GAS WORKS. MARSLAND WATER METERS. BAR AND JET PHOTOMETERS.

Manufactories:
512 W. 22d St., N. Y.
Arch & 22d Sts., Phila.

GAS STOVES,
SUGG'S "STANDARD" ARGAND BURNERS,
SUGG'S ILLUMINATING POWER METER,
Wet Meters, with Lizar's "Invariable Measuring" Drum.

Agencies:
177 Elm Street, Cincinnati.
244 & 246 N. Wells Street, Chicago.
810 North Second Street, St. Louis.
222 Sutter St., San Francisco.

HELME & McILHENNY,

(Established 1848.)

GAS METER MANUFACTURERS,

Nos. 1339 to 1349 Cherry Street, Philadelphia, Pa.,

WET AND DRY GAS METERS, STATION METERS, EXPERIMENTAL METERS, METER PROVERS,

Center Seals, Pressure Registers, Governors, Indicators, Photometers, and all other kinds of Apparatus for use in Gas Works.

FOULIS' PATENT STATION AND DISTRICT GOVERNORS.

REPAIRING DEPARTMENT.—We employ a special force of skilled workmen repairing meters of **all makers.**

WM. WALLACE GOODWIN, Prest. and Treas. WM. H. MERRICK, V.-Prest. S. L. JONES, Sec. S. V. MERRICK, Supt.

THE GOODWIN GAS STOVE AND METER COMPANY,

Successors to W. W. GOODWIN & CO.

1012, 1014 and 1016 Filbert St., Phila., Pa. 142 Chambers St., New York.
76 Dearborn St., Chicago, Ill.

WALDO BROS., Agents, 88 Water St., Boston.

MANUFACTURERS OF THE "SUN DIAL" GAS STOVES, FOR COOKING AND HEATING PURPOSES.

Dry and Wet GAS METERS, Station Meters (Square, Cylindrical or in Staves) Glazed Meters, King's and Sugg's Experimental Meters, Lamp Post Meters, Etc., Etc., Meter Provers (sizes 2, 5 and 10 feet), Pressure Guages of all kinds, Pressure Registers, Pressure and Vacuum Registers, Pressure Indicators (sizes 4 inch, 6 inch and 9 inch), King's Pressure and Vacuum Gauges, Dry and Wet Centre Seals, Dry and Wet Governors, Exhauster Governors, Photometers of all descriptions. Letheby's Sulphur and Ammonia Test Apparatus complete—also Testing and Chemical Apparatus of all kinds, and of the most perfect description, for all purposes relating to Gas.

GOODWIN'S IMPROVED LOWE'S JET PHOTOMETER.

Agents for Bray's Patent Gas Burners and Lanterns.

Special attention to repairs of Meters, and all apparatus connected with the business.
All work guaranteed first class in every particular, and orders filled promptly.

G. B. EDWARDS, Mang'r, New York.
S. S. STRATTON, Mangr. Chicago.

D. McDONALD & CO.,

GAS METER MANUFACTURERS.

(Established 1854.)

51 Lancaster St., Albany, N. Y. 34 & 36 West Monroe St., Chicago, Ill.

STATION METERS, EXPERIMENTAL METERS, METER PROVERS, PRESSURE & VACUUM REGISTERS, PRESSURE GAUGES, ETC.

Also STAR GAS STOVES, RANGES, and HEATING STOVES.

We use only the very best materials, and employ the most skilled labor, and by our long experience (32 years) and personal supervision of every detail, we feel justified in assuring the public that our goods will give perfect satisfaction. Every Meter emanating from our establishment will bear the State Inspector's Badge, and will be fully warranted by us. Our Annual and Calendar will be sent to Gas Companies upon application.

GAS STOVES. GAS STOVES. GAS STOVES.

THE GOODWIN GAS STOVE AND METER CO.,

1012-18 Filbert St., Phila., 142 Chambers St., N. Y., 76 Dearborn St., Chicago.

Agents, WALDO BROTHERS, 88 Water Street, Boston.

WM. W. GOODWIN, Pres. and Treas.
W. D. MERRICK, Vice-Pres.
S. LEWIS JONES, Sec.

SAMUEL V. MERRICK, Supt.
G. B. EDWARDS, Mang'r, N. Y.
S. S. STRATTON, Mang'r, Chicago.

SOLE MANUFACTURERS OF THE

"SUN DIAL" GAS STOVES,

The Most Economical, Efficient, and Durable Gas Stove Made.

GAS COOKING STOVE, No. 8 C.

SIZE.

Stove.	Oven.	Roaster.	Top.	Length over Extension Shelves,
37 in. high.	12 in. high.	12 in. high.	24 in. long.	36 in.
20 in. wide.	17¼ in. wide.	18 in. wide.	21 in. wide.	
	12 in. deep.	13 in. deep.		

This Stove has four burners on top, and double oven burner.

Consumption of gas with all burners in use, 42 feet per hour, at 1 inch pressure.

The top is made in sections, so that a greater variety of cooking utensils may be used. By lifting out the covers and crosspieces and putting in a suitable forked ring, which is sent with each stove, a wash boiler or other large utensil may be set over two burners. Our **No. 87 GRIDDLE** also fits in the same position. The roasting oven is provided with a cast-iron door.

All Fittings are Nickel-Plated.

GAS COOKING STOVE, No. 7 B.

SIZE.

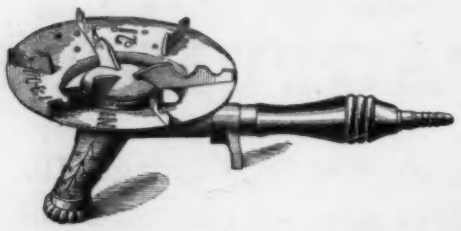
Stove.	Oven.	Roaster.	Top.	Length over Extension Shelves,
31 in. high.	9½ in. high.	10 in. high.	21 in. long.	32 in.
17 in. wide.	14½ in. wide.	15 in. wide.	16 in. wide.	
	12 in. deep.	13 in. deep.		

This Stove has three boiling burners in the Top or Hot Plate, and one single oven burner.

This cut represents our New Style Cooking Stove. As will be seen, it has an ornamented cast-iron Base and Front, and extension shelves. The Oven Burner, which is atmospheric (unless otherwise ordered), is of an entirely new and improved pattern (patent). The ovens are of greater capacity than those of the old style. The Top, in conjunction with the Outlet Pipe, is designed to carry off all the products of combustion, if desired, but they are also supplied with a loose ring which converts it into an ordinary open top stove.

The consumption of this Stove is 35 cubic feet per hour at 1 inch pressure, with all Burners in use.

All Fittings are Nickel-Plated.



"RADIANT" BOILING STOVE, WITH REGENERATIVE BURNER.

Size, 6¼ inches diameter, 3 inches high. Consumption, 6 feet per hour at 1 in. pressure.

HOT PLATE, No. 111.

Size, 36 in. long, 12 in. wide, with three double burners, 6 taps.

Consumption, with all burners in use, 36 cubic feet per hour, with 1 in. pressure.

¼ in. supply pipe should be used where the pressure is 1 in. or over.